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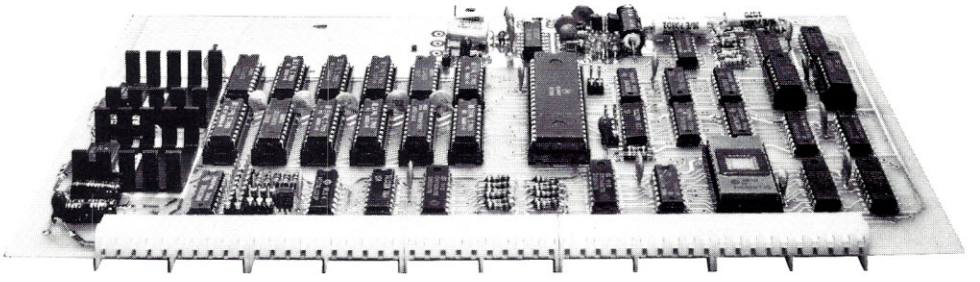

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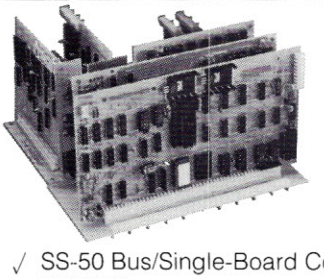

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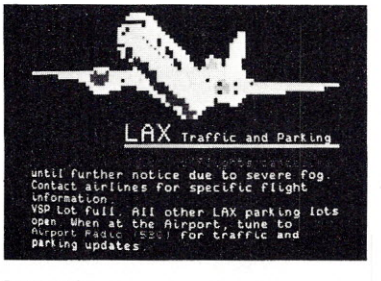

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Volume V
No. 10

This month:

We've waited...and we've wondered...and at last we know. IBM, the behemoth of the computer industry, has finally unveiled its much-awaited Personal Computer, a microcomputer designed to go head-to-head with Apple, Radio Shack, Commodore and company. (For a first look at the new machine, see page 246.)

Perhaps the most significant aspect of the announcement was the revelation that IBM has selected Microsoft BASIC and the CP/M operating system as the key elements of its Personal Computer software. Some industry pundits had predicted that IBM would opt for compatibility with its own, larger, systems in an attempt to become, for a time, the sole supplier of applications software for the Personal Computer. Instead, IBM chose to be compatible with the bulk of its microcomputer competitors, a determination that gives the PC a running start on program availability. Both users and software firms should benefit from this decision.

IBM's marketing strategy for the Personal Computer is also of interest. In addition to its own special PC sales unit and existing Product Centers, IBM will sell the new computer through ComputerLand dealers and Sears' new Business Systems Centers. The ComputerLand and Sears connections are a big boost for the Personal Computer, but the long-term success of the Sears alliance would seem to depend heavily on Sears' commitment to staffing its Business Systems Centers with knowledgeable sales people.

We'll have a detailed look at the IBM Personal Computer in the December issue of *Kilobaud Microcomputing*. At first glance, however, it looks like a winner.

—The Editors

This month's cover:

Photo by Ned Bunnell.

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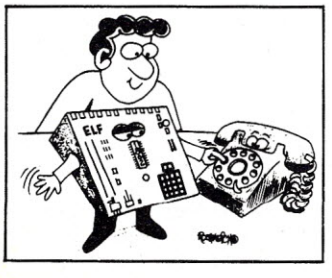

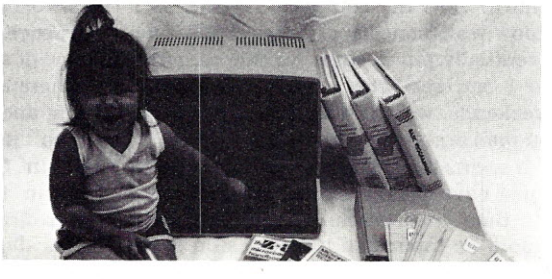

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By Wayne Green

Executive Computing

Man and Machine

Ergonomics is a new concept that has to do with an object being comfortable to use. The aim is to make the design of things more in line with human scale than with artistic goals. It's about time.

If we're going to get the business executive to use an electronic work place, we'd better design it so it is easy to use. The computer is supposed to be the best thing since the telephone for the business executive, but we have no comfortable way to use it.

Typewriters normally sit on a typing table or else jump out at you from a desk compartment. Few desks are designed with room for the newer IBM typewriters, much less a computer. And neither the desks nor the typing tables are designed at a convenient height for the executive.

Secretaries and stenos have to sit on those high chairs so they can reach their typewriters. The chairs are fine for sitting straight with feet on the floor. But most executives' chairs are geared to comfortable sitting, talking and thinking. This means the chair has to be quite a bit lower so the feet don't dangle in the air when the chair goes back.

With a substantially lower chair, the normal typewriter height is out of reach. And so is a computer placed on the desk, on a typing table or even in a typing shelf of a desk, if it could fit. The executive needs something a lot lower if he is going to be able to see the screen and type comfortably on the computer keyboard. So, if we are going to sell computers to executives, we'd better start designing work stations which are geared to them.

As perhaps a typical executive, I need to have certain things conveniently at hand, reachable from my low, comfortable chair. Most important are the telephone, the computer, a television set (for use with VTR and closed-circuit cameras), a calculator and phone index. I also have an IBM typewriter at hand, which I find better for most of my writing than the slower word processing systems.

The typewriter, computer, calculator and phone have to be close at hand, while the TV set and clock can be farther away for easier watching. With the chair at around 14 inches above the floor, the usual 29-inch-high desk is almost useless. Something lower is needed.

The alternative is to force the executive to have a chair that is normal secretary height and thus not as comfortable for the endless meetings and phone calls which make up a good deal of the day. As the computer becomes a communications center, more and more executive time is going to be spent whacking away at the computer keyboard, so it better be comfortably located.

I haven't seen a single desk or work station designed for the executive—and darned few for the average businessman who has to sit at a 29-inch desk shuffling papers. Much of the computer furniture has been designed for the mini and maxi fields which use the computer as a data input station for entering sales, addresses and so on. We're going to need something quite different for business work stations.

Probably not every executive will need a television monitor near his desk, but I find it most valuable. Firstly, I can watch a nice color television set in case some station is airing a program about amateur radio or computers. Then I have a video recorder hooked in so I can check tapes of programs I missed while I was working or out of town at a show. Another use, which we're just now developing, is to monitor the reception room so I can see who is lined up waiting to see me and to view the conference rooms so I know which ones are occupied. We may eventually put in some outside cameras so I can see what's going on during weekends, while I'm trying to catch up on mail and write editorials.

It seems likely that some of the readers must have designed some work stations for their businesses. I think everyone would be interested in articles on solutions to this problem, so let's see some.

For more on this subject, I highly recommend a paperback book called *Human Scale* by Kirkpatrick Sale. See, also, "VDTs: Are They Hazardous to Your Health?" (July 1981 *Microcomputing*, p.42) for a further discussion of the ergonomic question.

The Faltering Invasion

Just to keep you up to date on the Japanese computer invasion—it still hasn't really happened, and I see nothing of any great importance looming ahead to worry American firms.

If any of the Japanese firms have turned to American consultants in an effort to tackle the American market, I have yet to see any signs of it.

World Phenomenon

Micros have done well in Japan, as I'm sure you're aware. They are also growing in popularity in several other parts of the world. The next greatest growth to the U.S. and Japan has been in Great Britain, followed by Germany. They are also moving ahead well in France, Italy, Sweden, The Netherlands and Belgium.

Outside of Europe the interest in micros drops off. It is doing well in Australia, primarily as a result of the Dick Smith 80, known to us here as the PMC-80. This is a Hong Kong system built by Eaca and called the Video Genie in Europe. It's getting around. In New Zealand there are perhaps 2000 micros so far. In South Africa there are about 5000, with Apples predominant and Sharp coming on strong. I'll have more news of that scene in a month or so when I get back from a visit to South Africa, the scene of a microcomputer exposition.

There is considerable activity in Hong Kong and Singapore, but little so far in Korea and Taiwan, despite their activities in electronics. Both Korea and Taiwan have been noted for copying other firms and depending too much upon Japanese technology. I frankly think that their lack of development of radio amateurs has left them with too small a pool of electronic engineers and

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technicians to be able to compete with Japan and the U.S. in technology. The same goes for both Hong Kong and Singapore, who are noted for ripping off the developments of other countries. I know of no country in the world where the technological level is not in proportion to the number of radio amateurs.

Micros are getting started, if somewhat slowly, in South America. I'll be visiting there too and have more information for you soon.

In a way, we are fortunate that most of the countries of the world have not done much to encourage amateur radio. In fact, some, such as France, have gone to rather great lengths to discourage it. Well, they are paying the price.

In the Middle East, where you can count the active hams on one hand and have fingers left over (well, it isn't quite that bad, but almost), I've had little word of micros getting much action. A friend of mine in Jordan had one, but the demand for Arabic software has not been deafening. If Radio Shack ever comes up with an Arabic ROM for that area of the world, I'll start on program conversions to help open that market. Most of the Arab countries have English or French as a second language so they will be able to make do with currently available systems to get started. The closest computer store to the area is one in Athens, where they are working on Greek program conversions for us.

I'll be checking for micro activity in East Africa, though I've heard of little there so far. There are enough hams there so I'm sure that some of them must have computers. It's been 15 years since I've visited Kenya, so I'm looking forward to it.

This is going to be an awfully big industry by the time the whole world gets wind of it.

The Software Solution

It's too soon to tell if any of the firms in the field are going to make a major effort to get massive software support into the stores for their systems. With some of the weaknesses I see in the current products, I have the feeling that the market is still wide open for a winner in 1990.

Apple is in there plugging hard, but they must have lost one or two hundred million with the Apple III problems. This has set the whole micro market back substantially. Potential Apple III customers have put off getting other systems, and so they just have been holding their money. Frankly, I'll be surprised if the micro field grows by more than 100 percent in sales this year.

Compare that to the 300 percent growth per year we've had for the last five years, and we're looking at almost a depression by comparison. One result of this has been a stoppage in the growth of computer stores, and an increase in discounting.

The Tandy people have not helped either. Their change to the Model II and III systems created a lot of uneasiness. The almost total incompatibility of the II was not helpful. The incompatibilities of the III have not helped either. Early disk drive problems further chilled enthusiasm. In all, I doubt if Tandy has been having anywhere near the computer sales growth in recent months that they were enjoying last year. This could hurt their stock price.

Another long-range shadow is the Radio Shack formula for selling only fast-selling merchandise. This just is not geared to the computer market and can have some long-range problems for them. A recent International Resource Development report (46 pages) on Tandy came to the same conclusion, so I'm not alone in making this observation.

By sticking to a selected few fast-selling programs and steering clear of slower-selling software, Radio Shack is laying the groundwork for serious problems later on. Competitors could hardly ask for a better situation. If Tandy continues this self-destructive bent, investors may soon be looking for more progressive firms to support.

So far Radio Shack has been able to keep the major part of the market by virtue of their large number of stores—plus the weak response of their opponents. Atari, Mattel, APF, TI, etc., have been trying to sell game systems, thus keeping down their sales. Heath, Commodore, Exidy and some others have either lacked the cash or the commitment to make the advertising gamble made by Apple, thus keeping their sales down.

What will happen if a firm comes into the market with good hardware, lots of programs, healthy ad budget, a well-thought-out service system and effective distribution? It'll be a jackpot—billions.□

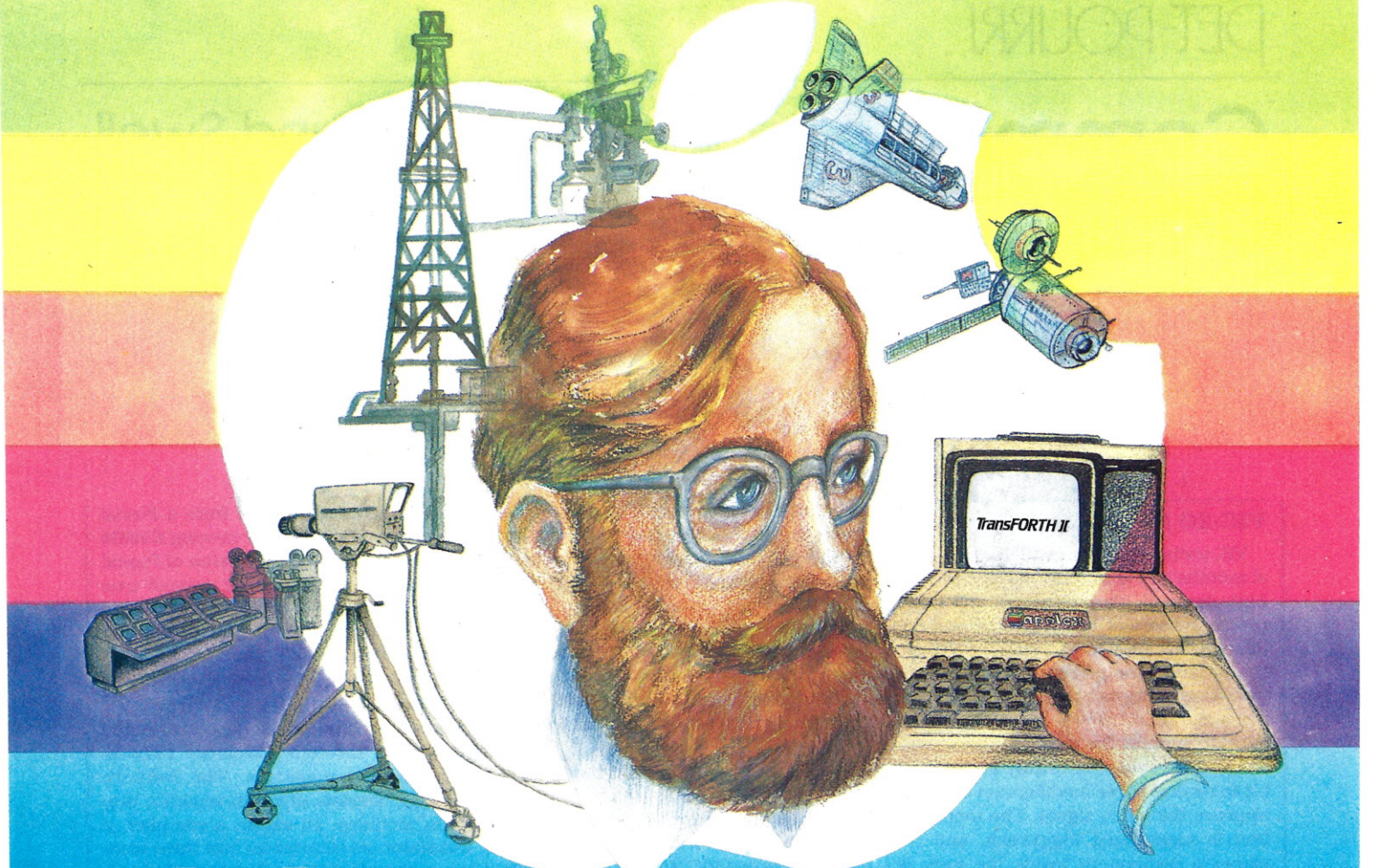
MICRO QUIZ

Analysis of Algorithms

When the following program is executed with N = 5083, what will be the final value of F?

```
100 F = 1
110 D = int(N/2)
120 rem
130 if N/D = int(N/D) then F = D: goto 160
140 D = D - 1
150 if D≥sqrt(N) then 120
160 end
```

(answer on page 268)



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VIC-20 News

VIC units have been available for several months now, but there has been a very high demand. Various stores and mass merchandisers at both regional and national levels are now carrying the VIC, so the situation should be improving. Commodore is doing its best to make the VIC a mass-market item and is making every effort to support the unit.

Any units sold prior to July 15 are eligible to receive a free modification that will improve the video signal. The modification is nicknamed Piggyback, and replaces a component inside the unit. It should be available through most Commodore dealers.

Units produced since late summer are now FCC-approved, with much better rfi shielding. Earlier units were produced under an FCC waiver and did not have to comply with the much tighter rfi limitations.

Back in late July the first software package was released, along with a dealer demonstration tape. The package offers six program tapes: Car Chase, Blue Meanies from Outer Space, Slither and Super Slither, VIC-21 (Black-Jack), Biorhythm and Compatibility and Space Math. Each game program lists for $9.95 on tape.

The dealer demonstration tape contains five programs that help show off the VIC features. Dealers are being encouraged to copy and distribute the demo tape to their customers, primarily within the home market.

Other new developments include a soon-to-be-announced dot matrix printer that will list for $395. Not too much information is available yet, but it should be an 80-column printer that will print the full VIC graphics set. It interfaces through a serial port and prints at 30 characters per second. The printer uses 8-inch-wide tractor-feed paper, so introduction may be delayed until supplies are available. Commodore intends to provide the paper and ribbons until other suppliers appear.

Commodore also is looking at a direct-access modem with originate and answer features. It is supposed to sell for under $120, but won't be available until the first of the year.

By October there should be a 3K memory expander cartridge available; the price is still undecided, but will probably be slightly more than the cost of a standard program cartridge, which currently sells for $24.95.

Speaking of cartridges, Commodore is in the process of releasing a number of games and application programs: Sargon Chess, a bridge tutorial and game, a word processor called VIC Writer that will look much like Word Pro and a number of adventure games.

There is also a group of action games, similar to Atari's, scheduled to be released just before Christmas. Joysticks are scheduled for introduction in October or November.

A programmer's reference guide is now available for $15. This is a user-friendly manual that is directed more at the programmer than the general user.

All in all, things are really moving, and we should start seeing more and more products being added to the VIC line. I now have a VIC, so I'll try to include a few VIC items in each column as space permits.

KMMM Pascal

In recent months a number of different languages have appeared for the PET, including several versions of Pascal. Many of these have become quite popular and have attracted an increasing number of users. The only Pascal I've been able to try so far has been the KMMM Pascal written by Willie Kusche and sold through AB Computers. This package looks impressive and is nicely done. Willie has really tried to provide a quality product and is constantly working on improvements.

KMMM Pascal is a true compiler; it generates machine language from a Pascal source file. When I was reviewing KMMM Pascal, it was the only version of Pascal available for the PET that created true machine code. All other versions used some form of interpreter, thus slowing the overall execution time.

KMMM Pascal is a subset of the full Pascal described by Jensen and Wirth. It is a superset of Tiny Pascal, described in the September through November 1978 issues of *Byte* magazine. The software package consists of seven separate program modules: an editor, a compiler, a translator, an interpreter and three sample programs (two in Pascal and one in BASIC). A manual is included, but it only covers the programs provided in the package. No attempt is made to teach Pascal, so you should have some experience with the language or get additional reference material.

The text editor is used to create and edit source files for input to the compiler. You can choose from two operating modes. In the command mode, the editor is like the text editor supplied by Data General with their RDOS disk operating system. In the window mode, you have an excellent, full-featured screen editor. There are so many commands and features, I really don't have space to describe them all. There are about 20 pages of documentation on the various commands in the manual.

The compiler reads the Pascal source file from disk or cassette tape and generates P-codes in memory. These P-codes can then be translated to machine code by the translator or interpreted by the interpreter. The compiler is written in machine language and is therefore quite fast.

The translator reads the P-codes stored in memory by the compiler and writes machine language back into memory. The machine language can then be exe-

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cuted immediately or saved on tape or disk for later use.

The interpreter decodes and executes P-code stored in memory by the compiler. It is capable of accepting various commands to allow single-step execution, setting and clearing breakpoints and displaying register or stack contents. In addition, the interpreter simulates file input/output by directing file output to the screen and accepting file input from the keyboard. Together these features provide an excellent debugging mechanism for developing your Pascal programs.

Going back to the Pascal language itself, a Pascal program normally consists of a heading and a block. The release I reviewed did not recognize the heading. If entered, the heading had to be a comment. Also, of the six parts of a standard Pascal block, KMMM Pascal would not recognize the label or type declaration parts. Certain limitations exist in various areas, and each is clearly documented in the manual along with any differences from standard Pascal.

KMMM Pascal has four reserved words that are not in standard Pascal—MEM, CAL, SHL and SHR. MEM is used like a BASIC PEEK or POKE, allowing you direct reference to specific memory locations. CALL lets you execute a machine-language routine, while SHL and SHR provide bit-shifting functions.

This Pascal package also provides five of the standard Pascal I/O procedures: READ, RESET, REWRITE, WRITE and WRITELN. The WRITELN procedure is the same as the WRITE procedure except a carriage return is generated after the last parameter. The READ procedure will not generate any kind of prompt when reading from the console, and it will not generate a carriage return/line feed after reading a value. Prompts and positioning are determined by the user's program.

Anyone seriously interested in Pascal should take a look at this package. I suggest that you only try running it if you have a 32K system. Different versions are available for the various ROM operating systems. The entire KMMM Pascal package was available for $75 through AB Computers, 252 Bethlehem Park, Colmar, PA 18915, but please check their latest prices before ordering. For more information you can write directly to Willie Kusche at Wilserv Industries, PO Box 456, Bellmawr, NJ 08031.

COMAL

COMAL (Common Algorithmic Language) is a new programming language that was developed in Denmark by Borge Christensen and Benedict Loftstedt. It combines the power of Pascal with the ease of BASIC, making programs much more readable. It allows longer variable names while using a more defined program structure. It's ideal for beginning students because it's easy to learn and use, and for more advanced programmers because it's structured and powerful.

Some of the features include:

- IF . . . THEN . . . ELIF . . . ELSE . . . ENDIF—powerful IF/ELSE conditions.
- CASE . . . OF . . . WHEN . . . OTHERWISE—similar to BASIC's ON . . . GOTO, but much easier to use.
- FOR . . . TO/DOWNTO . . . STEP . . . DO . . . NEXT—implements a standard loop with a condition at the end.
- WHILE . . . DO . . . ENDWHILE—implements a loop with a condition at the beginning.
- PROC . . . ENDPROC . . . EXEC—provides named procedures, similar to BASIC subroutines.

COMAL for the PET/CBM was released by Commodore (UK) in May 1981, but will not be available directly from Commodore. In fact, their newsletter specifically states "Please do not apply [for a copy of COMAL] directly to us." Commodore has placed their COMAL interpreter into the public domain, thus allowing distribution by other groups. Commodore (U.S.) has stated they *will not* be supporting COMAL here in the U.S. for the time being.

Anyone seriously interested in Pascal should take a look at this package. I suggest that you only try running it if you have a 32K system.

Len Lindsay, the original author of this column and of the former *PET Gazette*, has formed a COMAL user's group here in the U.S., and has full approval for the distribution of Commodore's COMAL. A Help disk has already been produced, and a COMAL handbook was being developed when I received my first packages of information. The user's group will be distributing copies of the manual provided by Commodore (UK), along with their own 200+ page handbook. They are also starting a Commodore COMAL program exchange, and will distribute user disks. A copy of the Commodore COMAL interpreter is included on each user disk as well as on the COMAL Help disks.

Currently, COMAL will only work on PET/CBMs with BASIC 4.0, but it will work on both 80- and 40-column machines. However, since COMAL is a 24K machine-code program itself, it will work only on 32K computers. A special COMAL board is also under development which will plug into the PET/CBM, thus reducing the memory loss.

The price for a complete COMAL starter kit is $47.50, plus $2 shipping. Len has offered a 10 percent discount if you order during October and mention this column. The package includes a COMAL Help disk, COMAL Pocket Reference Guide, COMAL handbook in a padded binder (plus a one-year free update), a one-year subscription to the COMAL Companion newsletter, Commodore's COMAL Interpreter and Commodore's COMAL manual with a one-year free update.

Orders or requests for additional information should be addressed to COMAL User's Group, 5501 Groveland Terrace, Madison, WI 53716.

Upgrade System

In my July PET-pourri column (p. 14) I mentioned a new memory expansion from Spima Computer in West Germany. Well, I finally got more details in English and it really looks interesting.

The Upgrade System was developed to increase the memory of the 8000 series CBMs. It contains an additional 64K of RAM in two banks of 32K, plus a special operating system in ROM. It comes with all necessary hardware, complete documentation and a demonstration program.

A Bank Select feature lets you switch between different programs in particular 32K memory banks without losing information. The bank switching can be done by program control, manually with switches on the upgrade system panel or by an optional external control via a connector on the rear of the unit. The external switching can be disabled and enabled by program control. LEDs on the front panel indicate which bank is currently active.

The ROM operating system also lets you create random access files resident in memory. The ROM software manages the files with free access within any of up to 31 data files.

This memory expansion seems more useful than the current Commodore unit with the extra ROM software that is included. However, keep in mind that this software may not be compatible with future Commodore operating systems. For pricing and additional information you can write Spima Computer GMBH, Turbinenstrasse 4, 6800 Mannheim 31, West Germany.

Miscellaneous

Unfortunately there was a small error in my "Find That Program" article in the May issue. Line 1030 of the first program,

PGM DATA, was listed incorrectly. The GOSU B9100. . . at the beginning of the line should have been GOSUB 1460. . . . Sorry for any inconvenience—I goofed in fixing up the listing for publication. However, anyone who requested copies on tape should have good copies of the original programs.

If you haven't received a Commodore newsletter in a while, that's because they've switched editors. Apparently there have been a number of changes within Commodore again. Maybe this time it will be for the better. On the other hand, the VIC group seems to be doing things right, with much better coordination.

Please remember to address all correspondence to my home address and include an SASE if you expect a speedy reply. If I'm away traveling I'll get back to you as soon as possible.

Word Pro File Printer

Listing 1 shows a little program that I just put together a few days ago. Surprisingly, it does come in very handy at times. It's sole purpose is to print a Word Pro *source* file, something you currently cannot do with Word Pro itself. Word Pro only lets you print the formatted output; you can only save and restore source files to disk. Another nice side benefit of this program is the fact that you don't have to load Word Pro just to look at a few files. Considering you have to reset the system to kill Word Pro, this can help avoid the inconvenience.

The program was written for Word Pro 3, but can be easily modified for Word Pro 4 and the 80-column machines. Simply change the value of LN in line 30 from 40 to 80. This value (LN) controls the line length that will be printed. The value of LM (in the same line) controls an offset from the left margin before each line is printed. Its current value of 20 will center a 40-column line in an 80-column page. If you're changing the program from an 80-column machine, you should set this to zero, or eliminate the PRINT#4, SPC(LM) in line 300. The program is preset to only read files from drive zero as set in DR$.

Lines 40–130 get the file name of the desired Word Pro file and open the file as a sequential data file. Note that the older command channel disk commands are used. This allows running to any disk with any appropriate BASIC.

Line 140 reads and ignores the two-byte program load address at the front of the file. Remember that the program load address is always passed as data whenever a program file is opened as a sequential data file.

Line 200 puts the CBM 2022/2023 printer in upper/lowercase mode as normally used for listings. Lines 300–380 then read the file character by character using a GET# command. Each character is converted from its display (screen) value to its ASCII value for the printer. The back-arrow must be specially decoded.

At the end of each printed line, the keyboard is checked to see if you want to suspend output, quit or continue (lines 400–440). When the program is printing, hitting any key will suspend output and display a short message. Hitting Q at this point will close the disk file and terminate the program. Hitting any other key will continue the output. The program will normally quit when the end of the disk file is detected. Any disk errors will be reported and the program will terminate after closing the files.□

```
10 REM WORD PRO SOURCE FILE PRINTER
15 REM
18 REM       BY: ROBERT BAKER
20 REM
25 :
30 LN=40: LM=20: DR$="0:"
32 :
33 REM SET LN TO 80 FOR WORD PRO 4
34 REM SET LM FOR LEFT MARGIN OFFSET
35 :
40 INPUT"■ENTER FILENAME   ■■■■";FL$
100 OPEN 15,8,15
110 OPEN 2,8,2,DR$+FL$+",PRG,R"
120 INPUT#15,EN,EM$,ET,ES
130 IF EN<>0 THEN 1000
140 GET#2,C$,C$
190 :
200 OPEN 7,4,7: PRINT#7: CLOSE 7
210 OPEN 4,4
290 :
300 PRINT#4,SPC(LM);: FOR X=1 TO LN
320 GET#2,C$: IF ST<>0 THEN 1100
330 C=ASC(C$): IF C=31 THEN C=C+192: GOTO 380
350 ON (C/32)+1 GOTO 370,380,360,370
360 C=C+64
370 C=C+64
380 PRINT#4,CHR$(C);: NEXT: PRINT#4
390 :
400 GET C$: IF C$="" THEN 300
410 PRINT "■■■PRESS ANY KEY TO CONTINUE, ■Q■ TO QUIT"
420 GET C$: IF C$="" THEN 420
430 IF C$="Q" THEN 1200
440 GOTO 300
900 :
1000 PRINT:PRINT"■DISK ERROR
1010 PRINT EN;EM$,ET;ES: GOTO 1200
1100 IF ST<>64 THEN PRINT "■ERROR■   ST=";ST
1150 PRINT#4
1200 CLOSE 2:CLOSE 15: CLOSE 4
READY.
```

Listing 1.

✓See List of Advertisers on page 242

By Frank J. Derfler, Jr.

Source vs CompuServe

IBS Is Also Race Entrant

Welcome to the Dial-up Directory! This series is devoted to providing you with information on the use of microcomputers as data communications devices. This month we will take a look at the information utilities: The Source, CompuServe and a newcomer called IBS.

Source and CompuServe: Stroke for Stroke

I have been working as an official at local swimming meets lately, and I have noticed the similarity between a swimming event and some of the competition we see in the data communications industry. Let me describe the 400-meter Information Utility Medley Marathon from start to the present.

The swimmer from The Source started in lane 1. This swimmer is young and aggressive, but short on experience. In lane 2 we had the CompuServe representative. This entrant is the youngest member of a family of experienced rough-water swimmers. They urged him on, but at the same time they probably wondered if he should even waste his time in the personal computing league.

The starting gun sounded in 1979. The Source entered the water with a splash and a roar. But he went so deep we thought he would never come up. CompuServe entered the pool cleanly and immediately began the smooth even pace that has been his trademark during the entire event. Source had an initial lead, but about halfway through the first 25 meters he started to wallow in the water—sometimes nearly disappearing from sight.

The Source team changed coaches at least twice in the first lap, but their swimmer was committed and there was little they could do. They printed handouts for the spectators, to tell them what strokes their boy was supposed to be using. The guy in the pool couldn't read the handouts, so he did a ragged freestyle. The CompuServe family waved a trim banner and their boy just kept stroking.

During the first lap, each swimmer had his supporters and detractors. A lot of people cheered for the Source swimmer because of his ambition, but they also wished he wouldn't disappear beneath the surface of the water so often.

The first turn was interesting to watch. The Source team got help from a famous coach named Red Dejest who infused their boy with new energy and gave him a big push. The CompuServe family decided that this was indeed a legitimate event, and told their swimmer to rearrange his strokes and add some variety.

We are now almost to the 50-meter turn in this 400-meter race. There is some activity in lane 3. A newcomer, swimming under the colors of IBS Telemail, has entered the water, after claiming he is not really competing in the same event. It is significant that he is wearing flippers and a mask and he seems to be moving out fast. He doesn't have much local support yet, but outside the fence some guys are sitting on the hood of a Rolls carrying Virginia license plates GTE, and watching his progress with great interest through field glasses.

"Both services are now swimming with long strokes and starting to develop new strategies for the next 25 meters."

For those of you who may be lost, here is what I said: Both CompuServe and The Source started their information utility services in 1979. The Source brought hope and frustration to its early users. The management would promise good services, and even get many on-line, but their equipment problems would often leave users with a crashed computer or very slow response. CompuServe is a large time-sharing system with many corporate customers. It was never officially stated, but I always got the feeling that the MicroNet information utility was just something to do with the equipment when the big corporations weren't on-line. Still, MicroNet has always been reliable and has shown a steady increase in available services.

Both systems began to change their style after the "first turn" in 1980. The Source worked its way out of management difficulties through a business arrangement with *Reader's Digest*. This arrangement gave them the money to make significant improvements to their hardware and operating systems. CompuServe seemed to decide that being an information utility catering to microcomputer users was a pretty good thing. They gradually lowered the profile of MicroNet and smoothly added features and services in the CompuServe main menu. The result is that both services are now swimming with long strokes and starting to develop new strategies for the next 25 meters.

The entry of Interactive Business Solutions (IBS) Telemail into the competition came as a surprise to most, but it shouldn't have. GTE Telenet announced long ago that they were going to provide an electronic mail service on their system, which had been only a data carrier until this time. However, GTE is now looking for corporate accounts. They don't want to get involved with the over-

Address correspondence to Frank J. Derfler, Jr., PO Box 691, Herndon, VA 22070. Send electronic mail to TCB967 on The Source, 70003,455 on CompuServe, or via the AMRAD CBBS 703-734-1387.

head needed to serve individual users. IBS took advantage of this situation, and is subleasing time to individuals from the IBS corporate account on the GTE Telemail system. They are serving as an umbrella, just as telephone companies do when they sublease service on very large commercial communications satellites to their customers.

Styles: Comparison and Contrast

If I had to evaluate the competition between The Source and CompuServe, I'd say they are neck and neck and only differ in elements of style. But to some people, style is important.

The Source seems to have solved their reliability problems. They have new computers on-line and in reserve. The new configuration has improved the speed of service too. The Source has always been a command-entry system. The user has to enter specific commands to get service. They have published several printed command guides.

If the commands are used properly, the system is very flexible and it will do much of the work of sorting information. For instance, a user can make the computer search UPI news stories for items of interest, and only display those stories containing certain key words. Various other research services are available to filter and arrange information just the way you want it.

CompuServe uses a menu-driven format. The novice user is gracefully led by the hand through many levels of menus to find the desired information, news or service. In addition, it is now possible for users to go to almost any page of data by direct command. This lets frequent users jump over menus and arrive at the desired features. This capability combines the best features of the command-entry and menu-driven formats.

In the area of services, The Source may have a few more research and reference facilities than CompuServe, although both have excellent stock market and business services. I believe The Source reflects the atmosphere of their Washington, DC home, with the kinds of political reporting and economic analysis they provide.

CompuServe certainly has more active user groups and more news about microcomputer systems. Their special interest groups include TRS-80, Atari, CP/M, amateur radio and Microconnection users. They also carry informative and interactive newsletters from Atari and Tandy. Both systems claim to have about 10,000 paid customers, and many people subscribe to both services.

Chatting on CB

Back in the good old days of amateur radio, "chewing the rag" was a favorite occupation. Hams would sit around for hours discussing various subjects. Later, citizen's band operators spent time the same way. That same occupation is the number one use of both The Source and CompuServe. The Source lets its users communicate in real time with Chat. In the Chat mode, any two Source users can exchange comments for as long as they can afford to stay on-line. The comments flow between users in blocks of characters. Sometimes blocks are delayed in arriving, while the computers perform other tasks, but many people find the system useful and rewarding. Round-table group discussions are supported by a bulletin-board system operating close to real time.

CompuServe has a creative simulation of the CB frequencies for real-time communications. Users have 40 channels they can scan, monitor or transmit on. Group discussions are handled easily, and each user is identified as he/she makes a transmission. Conversations on the CB simulation are faster-paced than those on The Source's Chat. Each transmission is usually shorter. They are also less private, since any user can monitor a channel. Both systems are very active.

The chatters and CBers make up a subculture of their own on each system. Some spend over 50 hours a week on-line, and 20 hours a week is common. Individuals and groups who have never met before sometimes get together and meet in person. It isn't known how they regulate conversations when they all get into one room without a computer in between!

Both services provide electronic mail features which store messages and deliver them when the addressee comes on-line. CompuServe's EMAIL is the weakest feature of their system. It is primitive compared to The Source's mail system, which provides for answering, forwarding, expressing, receipting for and multiple addressing of mail. CompuServe has promised improvements in their EMAIL.

Deciding

If you have to decide between subscribing to one information utility or the other, you have several factors to weigh. The first is the availability of a local entry point. The Source is available over both the TYMNET and Telenet value-added carriers. CompuServe is available over TYMNET and over CompuServe's own data network.

Each service has entry points in about 300 U.S. cities, but they are not all geographically the same. As a customer, you use the standard telephone system to dial into the TYMNET, Telenet, or CompuServe data carrier. The carrier then sends your signals digitally through computer switches to The Source or CompuServe host computers. You have to be near an entry point for one of these digital carrier services to avoid a long-distance phone call.

In certain locations you will still be faced with an added charge if you use CompuServe. The use of TYMNET to contact CompuServe results in an added surcharge of $2 per connect hour in nonprime time and $10 per hour in prime time. There is no added charge on The Source for the data-carrier service.

Any long-distance phone or extra service charges have to be added to the basic price of the service and membership. CompuServe membership is available as a part of many software packages sold by Radio Shack and others.

The initial membership is $19.95. The Source charges $100 to join the service, but their usual nonprime-time hourly rate ($4.25) is lower than CompuServe's ($5.00). Nonprime time is normally 6 PM to 5 AM and weekends in the caller's local time zone. Both services charge extra fees for some features. CompuServe does a good job of explaining these fees and telling you how big a bill you have run up.

After the factor of cost is decided, you next have to look at the services available. Both systems change and add services so quickly that I cannot publish an accurate list here. You need to check with CompuServe and The Source to see which system has features you will value most.

It is interesting that both of these electronic information services have felt the need to publish slick paper magazines to explain the system and its features to their users. This proves that paper media and electronic media still have different uses.

Paper media are easy for the reader to use, portable and full of visual appeal. The electronic media have advantages in getting information distributed quickly and in sorting great amounts of data for the user. Electronic media have a long way to go before they save many trees.

Telemail

IBS Telemail does not claim to be an information utility. It is an electronic mail system. As such, it will store and forward messages in two distinct formats. It has a private message system very similar to the one on The Source. The names of the commands are different, and an experienced Source mail user has to learn commands like ANSWER, PURGE and BYE instead of REPLY, DELETE and OFF, but the functions are the same.

The second message format is the familiar bulletin-board system. Bulletin-board systems exist for TRS-80 users and many others. No news, business or other centrally provided information features are available on IBS Telemail.

Interactive Business Solutions is primarily a software house providing database management and other systems for businesses using microcomputers. They established their account on GTE Telemail for the use of their software customers. They saw the advantage of making their services available to individuals and other businesses who may not have the volume of mail to justify a separate corporate account.

IBS has advertised lower rates than CompuServe and The Source. If your only interest is in electronic mail, this may be important to you. But keep in mind that they have fewer services available. The actual rate structure starts nonprime time after 9 PM local time, instead of 6 PM as for the other services.

It also requires a minimum deposit of $25 for each account. This deposit is drawn down at the rate of $3.50 per hour of system use. At the end of each month the deposit must be repaid to the $25 level. The deposit is refundable if a user terminates membership, but in practice it will feel a lot like a membership fee.

Here are the addresses you should write to for more information on the services offered by these information message utilities:

CompuServe, 5000 Arlington Centre Blvd., Columbus, OH 43220.

The Source Telecomputing Corporation, 1616 Anderson Road, McLean, VA 22102.

Interactive Business Solutions, 1208 Apollo Way, Suite 502, Sunnyvale, CA 94086.□

See List of Advertisers on page 242

By Walter Koetke

Learning With Spaceships

Simple Graphics Revealed

Another Look at Graphics

Last month we discussed the elementary graphics techniques required to produce bouncing balls, snowstorms, primitive art and a framed display screen. Now we'll tie most of these ideas together in a single game program involving a spaceship and ground-to-air missiles. Understanding this program provides a solid foundation in the programming techniques required to produce elementary graphics. This program has been used by teachers at the junior high school level with very positive results.

Fig. 1 illustrates the display we will create. The spaceship at the top continuously moves from one side of the screen to the other until it is hit by a user-fired missile. Missiles are fired from the launcher at the bottom center of the screen by pressing the space bar. The program indicates when a missile strikes the spaceship. If the missile misses, everything continues until another missile is fired. And so it continues.

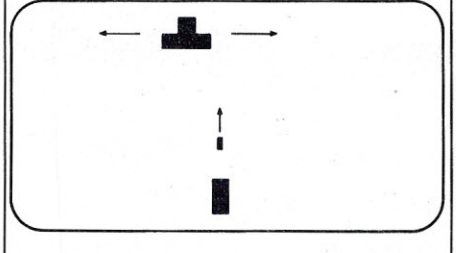

Fig. 1. Sample screen display of spaceship program.

As you'll discover later, there are many variations on this basic idea that can be implemented to produce a very interesting, challenging game. The purpose of this program is, however, to illustrate the basic graphics techniques. Once this is understood, students can be assigned the task of producing a game format, although many will be created just because appetites have been whetted.

Walter Koetke, Putnam/Northern Westchester BOCES, Yorktown Heights, NY 10598.

We will examine both a TRS-80 and an Applesoft version of this program. Both of these machines are highly recommended for instructional applications. Because I believe that all students should have access to both of these machines rather than just one of them, I urge you to understand both of the programming examples.

TRS-80 Version

Our first task after clearing the screen will be to design and then display the missile launcher at the bottom center of the screen. We will construct the missile launcher using two graphics characters as illustrated in Fig. 2. Because we want the missile to come from the center of the launcher, we form the launcher using three of the TRS-80 graphics columns—two from one character position and one from another. By later having the missile come from the middle column, we'll have achieved our objective.

The BASIC commands to create and display the launcher in the center of the bottom line on the screen are:

```
10 CLS
20 C$=CHR$(170)+CHR$(191)
30 PRINT @ 991, C$;
```

Fig. 2 also illustrates the spaceship, which we create using:

```
35 S$=CHR$(128)+CHR$(140)+CHR$(140)+
   CHR$(143)
36 S$=S$+CHR$(140)+CHR$(140)+CHR$(128)
```

Notice that the ship can be fully described using five characters, yet our ship contains seven characters. We added a space, CHR$(128), to each end of the ship. As we move our ship later in the program, each one-character movement in either direction will now completely erase or replace the previous image of the ship. In other words, we will be able to program simple ship movement with a single PRINT command to display each new ship without concern for the previous position.

If you're not comfortable with this explanation, wait until we've completed the program and you've entered it on your computer. Then retype line 35 or 36 with one of the CHR$(128) entries omitted. The resulting display should make the explanation more readily understood. Interactive learning really does work in many situations.

Our next task is to set up some initial values. For example, when a missile is launched, what is its initial position? If you haven't done it already, now is the time to look at the graphics worksheet in the back of a TRS-80 manual. Our missile launcher is in character positions 991 and 992. To be in the center, the missile should appear just above the left half of position 992. Hence the first rectangular representation of our missile will be at coordinate position 64,44.

The initial placement of the spaceship must also be decided. In this program we will use one variable, P, to maintain the character position of the left edge of the spaceship. We will use position 128 as the initial value.

There's one more initial value to consider. We will need to maintain one variable to indicate whether or not a launched

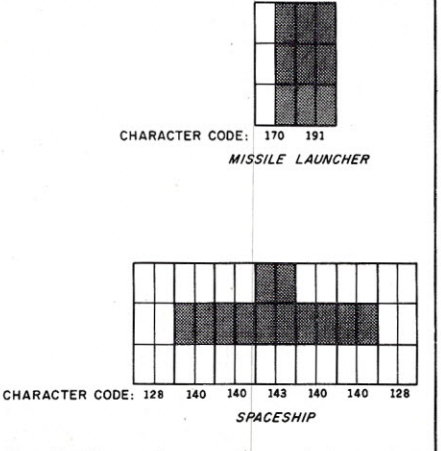

Fig. 2. Spaceship and missile launcher graphics characters.

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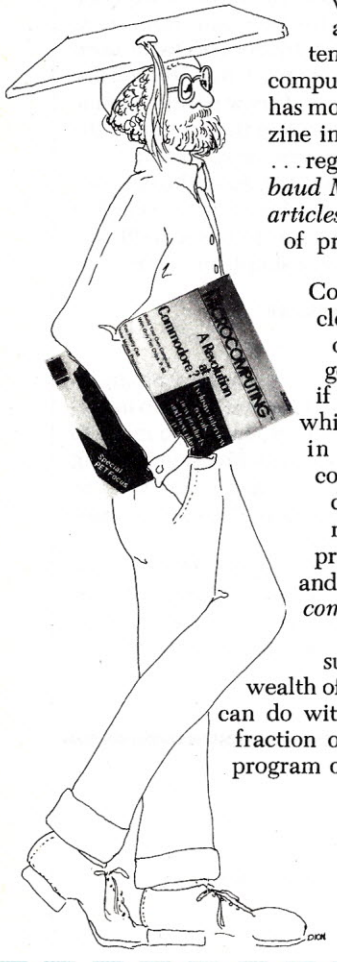

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missile is on the screen. Our program will take the easy course of not allowing a second missile to be launched until the first has disappeared. We'll use the variable FLAG for this purpose. A value of 0 will mean that no missile is on the screen, while a value of 1 means a missile is in the air.

These initial tasks can all be completed with:

```
40 OVER=64 : DOWN=44
50 FLAG=0 : P=128
```

Now we're ready to write a routine that will move and display the spaceship. Because we can display the entire ship at position P with the statement "PRINT @P, S$; ", we need a routine that always maintains the correct value of P. All of this can be done with:

```
60 IF P=191-5 THEN C=-1
70 IF P=128 THEN C=1
80 P=P+C
90 PRINT @P, S$ ;
```

Take a moment or two to be sure you understand the preceding four lines. Because our initial value of P is 128, line 70 makes 1 the initial value of C. After adding C to P, the program displays the ship at position 129. The second time those lines are executed, the ship is displayed at position 130. Remember our earlier work? Every time the ship is displayed we automatically remove the previous ship display—animation! Position 191–5 is the rightmost position our ship can occupy. Note that after the ship has been displayed in this position, line 60 changes C to −1. Then line 80 changes C to (191–5) −1 and the ship begins moving to the left.

Now that the ship is displayed, we must check to see if the user is pressing the space bar to launch a missile. If no missile is fired, we'll just return to the routine for moving the spaceship. This is done with:

```
100 IF FLAG=1 THEN 140
110 K$=INKEY$
120 IF K$<>" " THEN 60
130 FLAG=1
```

If you don't have a question, you're either very clever or you're not reading as closely as you should. Lines 110 and 120 do everything we just described. Can you describe the function of lines 100 and 130? Recall that FLAG = 1 means that a missile has already been launched. Hence when FLAG = 1 there is no need to check the keyboard—the user can't launch another missile until the current one has completed its mission. Line 100 skips checking the keyboard when a missile has already been launched. Line 130 sets the FLAG to indicate a missile was launched as soon as the user presses the space bar.

Our next job is to move the launched missile. We already have the initial position defined in line 40, so SET and RESET should do the job. There are, however, two additional considerations. If the missile missed the spaceship and is about to go off the screen, we've got to reset both the initial position and the flag. If the missile hits the spaceship, we've got to do something to end the program. All of this is done using:

```
140 RESET (OVER, DOWN)
150 DOWN=DOWN-1
160 IF DOWN<0 THEN DOWN=44 : FLAG=0 :
    GOTO 60
170 IF POINT (OVER, DOWN)=-1 THEN 200
180 SET (OVER, DOWN)
190 GOTO 60
```

Once again, don't go on until you understand the reason for each of the preceding lines. First, line 140 turns off the current display of the missile. Then line 150 calculates the next position in which the missile will be displayed. Notice that the variable OVER is never changed because the missile only travels vertically. Line 160 checks to see if the new position for the missile is off the screen. If so, the initial missile variables are restored and we transfer to the section of the program that moves the spaceship.

If the next position is on the screen, line 170 checks to see if the spaceship already occupies that position. If it does, we've hit our target and the program transfers to line 200 to report this success to the user. If we don't hit our target, line 180 will display the missile in its new position. Finally, line 190 returns to the section of the program that moves the spaceship.

The final task is to inform the user of a successful hit. As this program is only a sample of graphics techniques, we'll indicate a hit in a very simple manner:

```
200 CLS
210 PRINT @P, "KABOOM!" ;
220 PRINT @ 832, ;
230 END
```

And now you're a graphics programmer. If you've an idea you'd like to implement, try it. There is almost no merit to spending a long time with programming manual, pencil and paper before you use the computer. Sit in front of the keyboard and test your ideas.

The complete program already discussed is illustrated in Listing 1. If you have access to a TRS-80, be sure to try it. If you've any doubts regarding the use of

```
10 CLS
20 C$ = CHR$(170) + CHR$(191)
30 PRINT @991, C$;
35 S$ = CHR$(128) + CHR$(140) + CHR$(140) + CHR$(143)
36 S$ = S$ + CHR$(140) + CHR$(140) + CHR$(128)
40 OVER = 64 : DOWN = 44
50 FLAG = 0 : P = 128
60 IF P = 191-5 THEN C = -1
70 IF P = 128   THEN C =  1
80 P = P + C
90 PRINT @P, S$;
100 IF FLAG = 1 THEN 140
110 K$ = INKEY$
120 IF K$ <> " " THEN 60
130 FLAG = 1
140 RESET (OVER,DOWN)
150 DOWN = DOWN - 1
160 IF DOWN < 0 THEN DOWN = 44 : FLAG = 0 : GOTO 60
170 IF POINT (OVER,DOWN) = -1 THEN 200
180 SET (OVER,DOWN)
190 GOTO 60
200 CLS
210 PRINT @P, "KABOOM!";
220 PRINT @832,;
230 END
```

Listing 1. TRS-80 spaceship program.

a particular variable or instruction, change that variable or instruction and observe the results. This is a very effective way to learn.

Applesoft Version

Now that you fully understand the TRS-80 version of the program, we will explore an Applesoft version of the same program. Listing 2 contains an Applesoft program that does the same thing in the same order. In fact, line number integrity has been somewhat preserved to assist your understanding of the different programming techniques required. For example, line 170 is used to check for a successful hit in both programs, and line 30 is used to display the missile launcher in both programs.

In the Apple version of the program we aren't able to build single string variables to represent the missile launcher and the spaceship. Rather, they must be plotted as a series of small rectangles using low-resolution graphics. Thus line 30 plots three rectangles to make the missile launcher. A subroutine starting at line 300 is needed to display the spaceship.

As in the TRS-80 program, simply displaying a new ship automatically erases the previous ship. The erasing is done with lines 300 and 310 and the new ship is plotted in lines 320 and 330.

Another notable difference occurs on lines 110 and 120. Line 110 reads a single character from the keyboard and compares that character to a space. The addresses being peeked and poked are identified in the Apple user manual to be used in just this manner. While on the subject of manuals, the *Apple II User's Guide* by Poole, McNiff and Cook, Osborne/McGraw-Hill, 1981, is an excellent reference. Those looking for a student text with problems and possible use for self-instruction will have to keep looking. But those looking for a convenient reference can end their search with this book.

Other than the differences noted in the preceding two paragraphs, all of the other differences reflect no ideas that weren't discussed in last month's article.

When one of these programs is used as an introduction to graphics, be sure to explore a few of the many possibilities for extending the basic display given. All of the following ideas are rather easy to implement and most extend or verify an understanding of the graphics ideas.

Can you make a more appropriate, elaborate display when the missile hits the ship? Can you give the user a specific number of shots and count the number of hits? Can you make the missile move faster? Can you permit the user to move the missile launcher using the arrow keys or the paddles? Can you change the altitude of the spaceship after each trip across the screen? Can you give the spaceship vertical motion in addition to horizontal motion? Can you add an element of randomness to the ship's motion? Can you arm the spaceship?

And you've probably already thought of several other ideas. Graphics should not be reserved for the advanced students or for the better programmers. They are fun, and surprisingly easy after a few basic ideas are mastered. If you haven't already tried to do some graphics programming, grab last month's column and this one and start typing.□

```
10  GR : HOME
20  COLOR= 5
30  FOR R = 37 TO 39: PLOT 20,R: NEXT R
40 OV = 20:DW = 36
50 FLAG = 0:P = 1
60  IF P = 39 - 4 THEN C =  - 1
70  IF P = 1 THEN C = 1
80 P = P + C
90  GOSUB 300
100  IF FLAG = 1 THEN 140
110  IF  PEEK ( - 16384) - 128 <  > 32 THEN 60
120  POKE  - 16368,0
130 FLAG = 1
140  COLOR= 0: PLOT OV,DW
150 DW = DW - 1
160  IF DW < 0 THEN DW = 36:FLAG = 0: GOTO 60
170  IF  SCRN( OV,DW) = 13 THEN 200
180  COLOR= 9: PLOT OV,DW
190  GOTO 60
200  HOME
210  PRINT  TAB( 18);"KABOOM!"
220  END
300  COLOR= 0
310  PLOT P - 1,4: PLOT P + 3,4: PLOT P,3: PLOT P + 2,3
320  COLOR= 13
330  PLOT P,4: PLOT P + 1,4: PLOT P + 1,3: PLOT P + 2,4
340  RETURN
```

Listing 2. Spaceship program in Applesoft BASIC.

↙See List of Advertisers on page 242

By Frank Derfler, Jr.

Computer Communications

Wire into The Data Explosion

This is the first installment of "For Beginners Only," a regular monthly column that will be authored by various authorities in the microcomputing field on topics of interest to the beginner.

How many times have you heard, "But what can you *do* with it?" Some things a microcomputer can do really aren't very practical. This article will describe one very practical aspect of small computer systems: computer communications.

Many of us are tied down by what I call the "time tyranny of telecommunications." We have many communications devices in our homes, but most of them expect us to serve them. You have to be watching at 6 PM to see the evening news on television. You have to be home when the phone rings to get a call. You have to be listening at the right time to hear the song you like. Recently, devices to loosen the grip of this time tyranny have become popular. Video recorders, programmed turntables and telephone answering machines let us receive the information we want when we want it. The microcomputer can let us receive and transmit messages and information when it is convenient for us.

Computer communications is nothing new. Government and industry have been using it for years. The professionals differentiate between what they call telecommunications (messages) and telecomputing (running programs). The line between the two is now so thin that we can be safe making our own practical definition of telecommunications, excluding teletext systems, to include any system for the exchange of data over regular telephone circuits. (Teletext systems use television signals to transmit data.) This exchange can be between you and me, you and a message service or you and a large computer system known as a utility. These are called direct, indirect and interactive forms of communications, respectively.

The Microperipheral Corporation markets versions of the Microconnection for direct connection to the data bus of TRS-80, Atari and Apple II microcomputers, and for any RS-232C system.

Direct

As an example of direct communications, let's assume that you and I each have a home computer. You have an Apple and I have a TRS-80. Both machines use a form of the BASIC programming language written by Microsoft, so we might take a BASIC program from my system and use it on yours (assuming no special graphics, unique commands, and so on). But the disk or cassette operating systems are not compatible. Will the program have to be entered by tedious typing on the keyboard? Not if we can telecommunicate!

If we both have communications software for our computers, I can call you on the telephone and transmit the program to you using a telephone coupler device called a modem (modulator/demodulator). After you receive the program, you can save it and use it later in the regular way.

Indirect

Scattered around the country are over 150 electronic bulletin services operated for the free and open use of the public. Bulletin boards are microcomputers running special programs and equipped with automatic-answering hardware and software. You can dial into these services using your computer, look at different summaries of the messages posted on the bulletin board, read those that interest you and leave messages of your own. Some of these bulletin-board services are regional, some concentrate on posting information about certain brands or systems of com-

Frank J. Derfler, Jr. (PO Box 691, Herndon, VA 22070), is the author of Microcomputing's *monthly data communications column entitled "Dial-up Directory."*

puters and others carry special-interest information such as genealogy, investments or medical technology.

Bulletin-board services vary in the kinds of things they do, but they are all easy to use. Many will recognize your name when you sign on and tell you if any messages are addressed to you. Others serve as a software library and allow you to deposit and withdraw programs for specific computers.

Some will let you run programs on their system. This is particularly useful when they have programs that your machine can't run because of memory size or other hardware factors. Table 1 lists several phone numbers of different systems. The comments will give you some ideas of the personality projected by each. Bulletin boards represent indirect communications because the person sending and the person receiving messages don't have to be on the system at the same time; the system serves as a relay.

Interactive Systems

Would you like to have a large mainframe computer with several different programming languages available for your own use? Would you like to have electronic mail service like members of Congress and executives of large corporations? Would you like to have an interactive news service that will scan up-to-the-minute and past news stories for items of interest to you? Would you like a stock market and travel reservation service in your home? These things are all available at reasonable prices through computer utility services.

Peoples' Message System, San Diego, CA. 714-449-5689. Bill Blue runs this active and creative system. Every feature of bulletin-board systems is found here. A broad spectrum of users, many with Apple computers.

Remote North Star, Atlanta, GA. 404-939-1520. A fine system serving the S.E. with messages and programs to run. A good source of information on CP/M and North Star systems. Les Freed and Bob Strong are the operators.

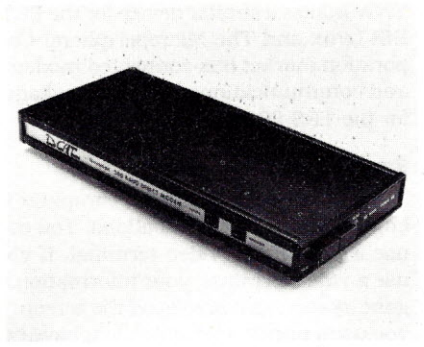
Computer Bulletin Board System, Chicago, IL. 312-545-8086. Ward Christensen and Randy Suess get the credit for putting the first computer bulletin-board system "on the air." The Chicago CBBS was the first sustained operation in the nation. It serves as a nationwide exchange for computer information and ideas.

AMRAD CBBS, Washington, DC. 703-734-1387. AMRAD is a nonprofit organization of people with an interest in amateur radio and microcomputer systems.

ABBS #1, Vienna, VA. 703-255-2192. Craig Vaughan and Bill Blue developed the first Apple bulletin-board system. Craig runs this demonstration and development system. It has many unique features.

FORUM-80, Kansas City, MO. 816-861-7040. Bill Abney wrote the original software for the FORUM-80 systems and this is system #1. Stop here for TRS-80 info.

Table 1. Some of the over 150 available bulletin-board systems.



The CAT modem by Novation is one of the most popular and economical external modems. The modem communicates with the computer's RS-232 serial port. This is the direct connect version.

Would you like to have electronic mail service like members of Congress and executives of large corporations?

ESI Lynx markets two modems which interface directly with TRS-80 and Apple II computers. They come complete with a nice communications software package.

Utilities are large computers or groups of computers that can be accessed by telephone networks. You have probably heard of time-sharing systems. You and many other users share the time of an efficient large computer system, and you share the big library of programs, languages and information services. Many of these systems cater to commercial customers during regular business hours, but open their services to private individuals at very low rates off prime time.

The Source, CompuServe and Dialog are three major information utilities. The list of information and personal services they provide is growing daily. They have their own bulletin boards and special user's groups. They have educational programs, financial programs and more.

Utilities bill for the time you are on the system plus a flat fee for joining. Initial one-time fees run from $20 (CompuServe) to $100 (Source). Nonprime-time hourly rates usually go from about $3–5 an hour, but they can reach $10 an hour if you live outside the continental U.S. These rates include the telephone connection from the 100 or so largest metropolitan areas of the U.S. If you live away from a major city, you will probably have to also pay a telephone toll charge to use one of these interactive computer utilities.

Technical Talk

Most microcomputers have a standard or optional two-way serial-data communications port using a signalling standard called RS-232C. (The PET is a notable exception, although devices are available to convert the PET output port signals to RS-232C.) This port sends data out as positive- and negative-voltage direct-current signals. Printers and other devices can use these dc signals, but telephone lines cannot.

A modem is used to convert the dc voltages to audio tones that can go over the phone lines. Two different tone systems are used to transmit in two directions over the same phone line. The frequencies of these tones are shown in Table 2. "Originate" tones are used by remote terminals (you) dialing into bulletin boards or computer utilities. "Originate only" modems are available on the surplus market and will work fine in these applications.

If you want to communicate directly with another friend, one of you will need a modem able to operate using the "answer" tones. A switchable originate/answer modem is needed to have full capabilities.

Two methods are used to connect modems to the telephone system: acoustic and direct connection. When you use an acoustic modem you place the telephone handset in a special cradle and the phone and modem speak to each other. A direct-connect modem plugs into a telephone wall jack.

Novation and Hayes Microcomputer Products both make interesting RS-232C

modems. The CAT modem from Novation is one of the best known modems in the U.S. It comes in both acoustic and direct-connect versions. The Hayes Smart-Modem is a unique device containing its own internal microprocessor. It monitors the RS-232C line for commands telling it to dial a number, answer the phone and perform other functions.

Some modems do not require a serial port to connect to a computer. These modems are more expensive but they eliminate the added expense of a serial port. They connect directly to the computer data bus and the telephone line, and need no intermediate RS-232C or modem devices.

Hayes Microcomputer Products makes this kind of hardware for the Apple and S-100 bus computers. Potomac Micro-Magic has a product for the S-100 bus and TNW makes a similar device for the PET. ESI Lynx and The Microperipheral Corporation market bus-connected modems and communications software packages for the TRS-80 and other computers.

Smart vs Dumb

You don't actually need a computer to engage in telecommunications. You can use a printing or video terminal. If you use a video terminal, your information is gone as soon as it scrolls off the screen. If you use a printing terminal, you have only a hard copy, not a computer file that you can run or manipulate later. These devices are often referred to as "dumb" terminals because they don't remember what they have seen.

Various programs are available for microcomputers that give them a dumb communications capability. CompuServe, The Source and Radio Shack market terminal programs for the TRS-80, Apple II and other common computer systems. They are usually in the $30 price range.

If you use a microcomputer with appropriate programming as a "smart" terminal, you can display the data you send and receive, save it as one of several kinds of files and recall it later to run, edit, print, etc. You can also prepare files in advance and transmit them more quickly and efficiently than you can by typing while on-line.

Most smart-terminal programs are

Modem Signalling Tones

	Transmit	Receive
Originate	2225 and 2025 Hz	1270 and 1070 Hz
Answer	1270 and 1070 Hz	2225 and 2025 Hz

Table 2. Modems convert plus and minus 12-volt RS-232C signals into these audio tones for transmission over phone lines. The originate signalling mode is usually used for remote terminals.

Source Telecomputing Corporation
1616 Anderson Road
McLean, VA 22102
703-821-6660
800-323-1718

Personal Computing Division
CompuServe, Inc.
5000 Arlington Centre Blvd.
Columbus, OH 43220
614-457-8600

Table 3. These computer utilities provide varied information, computing and message services.

↙65 for facing page→

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written for disk systems. The disk gives great flexibility and convenience. Let me describe a typical session with a bulletin-board system using David Lindbergh's Omniterm communications program (see Table 4).

First, prepare messages for later transmission into the system, writing and editing the messages using a word-processing program such as Scripsit or Electric Pencil. These programs store text files on disk. Then, load the communications program and select various options to configure your computer exactly to the system you want to call. Next, dial the phone number of the bulletin board and get a carrier (tone) on the third ring. (My modem answers the carrier with a tone of its own.) The bulletin-board system then asks you to send a couple of carriage returns so that it can sense the data rate at which your terminal is operating (300 bits per second is normal). It next sends a system sign-on message and asks for your name and phone number. After you reply, it sends a command menu that may look like:

COMMAND: A B D E G H K N P R S Q

Replying to this command line with an H calls for Help. Most systems have extensive directions available. It is wise to study the options and control codes used by each system, because they do differ.

If a user is interested in seeing what messages are on the system, entering an S command will provide a summary. Some systems have hundreds of messages on file and will ask for some limitation on message numbers or dates. The summary will show the sender, addressee and subject. The user notes the numbers of interesting messages, and uses an R command to read them. Some systems provide for flagging of messages during the summary for later automatic recall. Others will allow sorting the messages by subject, date, sender, etc.

As you read the messages you are interested in, they are stored in your own computer. When you're done reading, one keystroke dumps the contents of your computer's memory to the disk file for future use. Next, an E command lets you enter a message. The pretyped message goes quickly from the disk, through your computer, out the RS-232C port and modem, and over the phone lines to the bulletin-board system. The system echoes everything it receives, so the screen shows a confirmation of what was sent.

Some systems allow editing and review of messages before they go to file, but since your message is pre-edited, you can tell the bulletin board to save the message, and send it a G for goodbye. (See Table 5 for a summary of typical bulletin-board commands.)

This exchange took from three to five minutes. The bulletin board might have been down the block or across the nation. The information exchanged could have been messages or programs. It could have dealt with my computer system, genealogy or computer games, but no matter what the topic, the bulletin board provided a quick and efficient way to transfer information among many people.

The world of computer communications is growing fast. In the future, information may be pumped to you much more efficiently than in the past. The time tyranny of telecommunications is almost at an end. You will put one foot beyond the present and into the future when you experience the thrill of computer communications.□

Lindbergh Systems, 49 Beechmont St., Worcester, MA 01609. Omniterm for TRS-80 Model I and III computers. About $100.

The Microstuf Co., PO Box 33337, Decatur, GA 30033. The Crosstalk programs for North Star and CP/M systems. Costs $100 and up, depending on the version.

Small Business Systems Group, 6 Carlisle Rd., Westford, MA 01886. ST80 communications programs for the TRS-80.

Software Sorcery, Inc., 7927 Jones Branch Drive, McLean, VA 22102. Apple II communications programs. Costs $45 and up.

Southwestern Data Systems, PO Box 582, Santee, CA 92071. ASCII Express II for Apple computers. About $60.

The Software Toolworks, 14478 Glorietta Drive, Sherman Oaks, CA 91423. Reach for the H/Z-89. A bargain at $20.

Table 4. This list shows the suppliers of telecommunications software for various systems. Always check with the supplier to insure compatibility with your hardware configuration.

Typical Bulletin Board Service Commands

B—Print bulletins. Messages of interest to all users.

C—Case switch. Changes from all caps to upper/lowercase.

D—Duplex switch. Changes from echo of characters (full duplex) to no echo (half duplex).

E—Enter a message.

G—Goodbye. Terminates the connection. Many systems allow for leaving a message for the system operator before final sign-off. Always use G when leaving because it allows the system to recycle.

H—Help. Directions for users.

K—Kill a message.

N—Nulls. Nulls are needed by people using printing terminals. They allow time for the carriage to return.

P—Bell switch. Bell or no bell sent by the system.

R—Read or retrieve a message, usually by message number.

S—Summary of messages. This listing will show the message number, sender, addressee and subject. May include the date and other data. If the system does not have a flagging function, you must write down the numbers of messages you want to see, for later retrieval.

Q—Quick summary. Shows only the message numbers and subjects.

Control Codes

Control codes can be used to interrupt or change the functioning of the system. They are not standardized. This is a representative list.

CTL-C Cancel the current printing and move on.

CTL-K Kill the current function and go to command menu.

CTL-S Stop (or re-Start) printing. Useful if you have a video terminal with a small screen and you want to read the information before it scrolls off.

Table 5. These commands and codes are used by most bulletin-board services. Many systems have other options, but this list can get you started.

Modem Manufacturers

ESI Lynx, 123 Locust St., Lancaster, PA 17602. 717-397-2531. The Lynx Modem.

Novation, Inc., 18664 Oxnard St., Tarzana, CA 91356. 213-996-5060. Many different modems, both RS-232C and bus-connected.

The Microperipheral Corporation, 2643 151st Place, NE, Redmond, WA 98052. 206-454-3303. The Microconnection modem.

PMMI Communications, 5201 Leesburg Pike, Suite 604, Falls Church, VA 22041. An integral S-100 bus modem device.

Hayes Microcomputer Products, 5835 Peachtree Corners East, Norcross, GA 30092. 404-449-8791. Integrated modems for Apple II and S-100 bus systems and a SmartModem RS-232C device.

TNW Corporation, 3351 Hancock St., San Diego, CA 92110. 714-225-1040. Specializing in PET/CBM products.

Dialog Information Retrieval Service, 3460 Hillview Ave., Palo Alto, CA 94304. 415-858-2700.

Table 6. Modem manufacturers.

241 for facing page→

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Compiled by Eric Maloney

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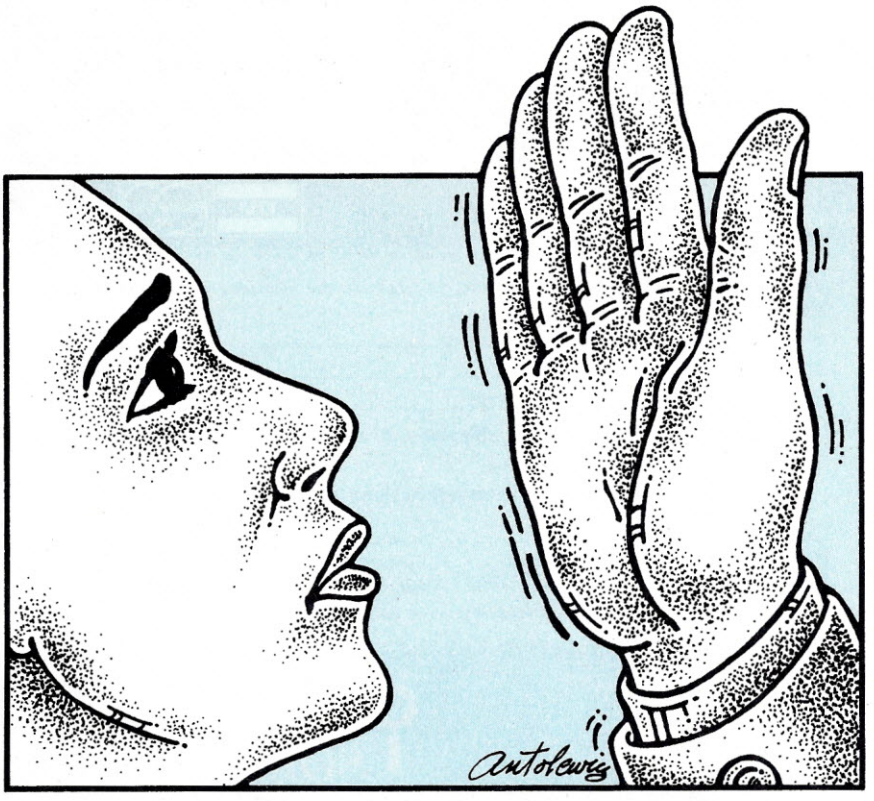
Trying to Make It in the Computer World



Women and Computing

Women in computer fields face unique problems in advancement, salary and management. To help cope with this, a group of women has formed the Association of Women and Computing, a 350-member organization with eight national chapters.

Their goal is to support women by offering career counseling and a network of job contacts, as well as seminars, workshops and scholarships.

Only 25.7 percent of computer specialists are women, according to the federal Office of Occupational Statistics. Of computer programmers, 28.7 percent are women; of computer systems analysts, 22.4 percent are women.

Rita Sisul, former president of the St. Louis chapter, says increasing specialization is boxing women into entry-level jobs. The more creative positions—systems programming and analysis—go to males, while women hold low-level programming and maintenance spots.

Women also face resistance from males. Carol Grosvenor, a computer programmer for ten years before she established her software consulting firm, Chocolate Chip Computer Company, says some businessmen find her threatening.

"In the small-business environment I'm viewed as a person with technical expertise," she says. "In the large business environment I am tolerated as a woman, and my technical expertise is downplayed."

She also commands less money from the larger dp firms.

Leslie Tyson, whose chapter in Washington, DC is made up of mostly midlevel computer programmers and systems analysts, says "There is still a good deal of resistance to women." But it's not from their peers as much as upper-level management.

"It's spreading out in the corporate environment," she says. "A lot of these women are chairing meetings (and) are finding that men just above them have never had to deal with this before."

Grosvenor, who is vice-president of the group's L.A. chapter, says she "felt very isolated" when she worked in dp companies, but was "able to adopt a mentor or sponsor in certain situations" who helped her advance.

"I've also left a company entirely because I couldn't stand being in a male-dominated field," she says.

Tyson has found that some men are quite willing to be mentors to these women, and some have even joined the association. Other men joined because they were minorities. The DC branch has about 15 men.

"Most men who come just listen," she adds.

However, some men joined the group "with the idea that it's a good place to meet women," says Tyson. "There are a lot of high-powered women here. If you come in with that idea—you're going to get blown away."

The group has sessions to discuss such topics as stress, power, task management and investing. "A lot of these women, even at entry level, are in a bracket where they are interested in tax shelters," observes Tyson. But most workshops have dealt with interpersonal relations.

Do women have difficulty with man-

agement because their backgrounds make them intimidated by authority? Tyson thinks that's just an excuse. "We feel we've gotten a little behind the eight ball because we haven't gotten the training. But our feeling is, if you want something, go out and get it." The association is there to provide the resources.

"We want to identify those areas (of need) and strengthen them," she says.

She hopes that the association will act as a network, helping women make contacts in industry.

Grosvenor has also established an information service called WISDOM (Women's Information Service and Directory of Materials). The network is maintained in San Francisco, San Diego and Los Angeles, and is equipped with two Radio Shack Model I's, a Model II and an Alpha Micro System, respectively. The system has been operational since January 1981 and WISDOM is actively recruiting women's college groups and professional and business organizations as subscribers.

Contributed by Betty Thayer, *Microcomputing* staff

Bawdy Bauds

Forget the bar scene, ladies and gentlemen. You no longer have to go public in your low-cut latex, leather and chains or urban cowboy attire. You no longer have to be attired at all with the latest in computer bulletin board fashion. Straights and gays, singles and those of you who are not so single, bi's and tri's—you can all meet in the privacy of your own home if you have the right equipment.

We're talking hardware and software. We're talking about one of the fastest growing genres of CBBSes—those that devote themselves to sexually-oriented material. You never dreamed what your micro could do for you.

Four such systems are now on line: Kinky Kumputer, South-of-Market and Lambda in San Francisico, and Midwest Underground in Missouri. All operate at 300 baud and are accessible with a micro, a modem and the correct terminal software.

Although Kinky Kumputer, South-of-Market and Lambda are primarily for the gay community, heterosexuals and bisexuals are welcome to use the system, and often do. Midwest Underground states that its purpose is "helping people make new friends" and its messages are grouped in five categories: unclassified, kinky, straight, bi or gay.

(Unfortunately, we couldn't find out who is using Midwest Underground—the media is "expressly not welcome.")

There's no doubt that sexually oriented BBSes are popular. Sagittarius and Koala-Bear, the system operators at Lambda, estimate they average 45 calls a day, which they say is the same as the other three systems. In its first two and a half months, Lambda received 2200 calls. Sagittarius and Koala-Bear are already receiving complaints that people can't get on their system, and are planning to go to a multi-user system in the near future.

Lambda does not advertise except on the Kinky Kumputer and South-of-Market bulletin boards; its publicity is by word-of-mouth.

You'll find a wide range of interests and lifestyles on the sexual BBSes. As with many BBSes, you can quickly scan message summaries before going to the complete message. This can be intriguing, with message subjects ranging from such general topics as "fun," "good times," "paradise," and "fantasy" to more specific topics such as "latex," "Flamingo sex," "climaxatrons" and "gladiator movies."

In addition to message space, Kinky Kumputer offers computer-generated dirty stories involving Cliff and Raymond or Joe and Bob, with such tingling dialogue as:

"'Hi Bob. Call me Joe.'

"'Hi, Joe.'

"'Bob. . . Bob.'

"'What's in a name? Beauty, that's what! I can't stand it any more! I just love your outfit,' he volunteered."

If using a BBS to advertise for a person of your favorite persuasion is a bit too public for your taste, have no fear. Midwest Underground states that, "Your real name is available only to the system operator, unless you place it in the body of a message on purpose. Underground allows passwords and address codes to insure your message gets to the person it's addressed to, and can only be read by that person, if that's what you want." The Lambda system reports that 40 percent of its messages are private.

As soon as you're on the system, Lambda, South-of-Market and Midwest Underground inform you that you've accessed a sexually explicit BBS, just so you know what you're getting into. Most of the material is sexual, but every once in a while you run across a truly unique message, like the one on the S-O-M bulletin board system shown in Fig. 1.

So if you're tired of all the tried and traditional ways of meeting people, can't get into the bar routine, are into flamingoes but don't want to flaunt it at the local disco or would just like to meet someone who enjoys a Balkan folk fling, these BBSes might be for you. Plug in and turn on. After all, these are the 80s.

Contributed by Lise Markus, *Microcomputing* staff

```
MSG # 74
SUBJ.: LONELY IN BERNAL HEIGHTS
TO: ALL CALL-INS
FROM: PLEASE
DATE: 07/05/81  3:00 AM

DOES ANYBODY OUT THERE LIKE TO FOLK
DANCE?!!! I'M TIRED OF SEX AND WOULD
REALLY LIKE TO GET OUT AND HAVE SOME
FUN! BALKAN, IRISH, ISRAELI, SCANDI-
NAVIAN, OR JUST A FRIENDLY POLKA?
HEY!!! WHAT THE HECK!!! I DON'T
BITE!!! THROW OUT YER WHIPS, CHAINS,
AND PUT ON YER DANCIN' SHEWS! IT MAY
BE THE WIERDEST THING YOU'VE EVER
DONE.
LEAVE A MESSAGE FOR 'LONELY', AND
MAYBE WE COULD GET TOGETHER FOR THE
TIME OF OUR LIVES.
```

Fig. 1.

```
39.  06/25/81  FLAMINGO SEX
     TO: FLAMINGO FETISHISTS FROM: PRECIOUS CHICAGO
     MESSAGE POSTED AT   9:29 PM

38.  06/25/81  PUNK SEX
     TO: CR FROM: LIZ
     ( MESSAGE POSTED AT   8:46 PM

36.  06/23/81  BI GIRL WANTED
     TO: ALL BI GIRLS FROM: PETER
     MESSAGE POSTED AT   9:24 AM

35.  06/23/81  GAY MEN
     TO: ALL CALL-INS FROM: DON
     MESSAGE POSTED AT  12:23 AM

34.  06/22/81  TENDER GUY
     TO: ALL CALL-INS FROM: RON
     MESSAGE POSTED AT  10:40 PM

33.  06/22/81  THE RAUNCHIEST
     TO: ALL CALL-INS FROM: MARTY
     MESSAGE POSTED AT   5:04 PM

32.  06/21/81  CALLING GAY EST GRADUATES
     TO: ALL CALL-INS FROM: DUNWOODY DECIBEL
     MESSAGE POSTED AT   8:13 AM

31.  06/19/81  WOW, THIS IS GREAT.
     TO: ALL CALL-INS FROM: DIANNE
     MESSAGE POSTED AT   1:58 PM

30.  06/19/81  SLAVE SALE
     TO: JANE FROM: MASTER D.J.D.
     MESSAGE POSTED AT   9:13 AM

29.  06/15/81  HOT W/M STUDING B&D,T/V,??
     TO: ALL CALL-INS FROM: ARAB
     MESSAGE POSTED AT  11:01 AM

28.  06/11/81  GOOD TIMES
     TO: HOT TO TROTS !!!!! FROM: MARTY
     MESSAGE POSTED AT  10:18 PM

27.  06/11/81  SLAVE SALE
     TO: ALL CALL-INS FROM: JANE
     MESSAGE POSTED AT   5:26 PM
```

Fig. 2. Summary of messages on South-of-Market bulletin board system.

Micros in the Psych Lab

Microcomputers are appearing in psychology labs at many major universities, as instructional aids for students of experimental psychology. The micros, mostly Apples, are being used both to simulate and control experiments.

For example, software is available to convert the microcomputer into a tachistoscope, a device that measures reaction time and short-term memory. The package, produced by Conduit (PO Box 388, Iowa City, IA 52244) is used for "classroom replications of classical experiments," a company spokesman says.

The computer displays text or a picture, and then removes it; subjects try to recall what was on the screen. The Apple uses high-resolution graphics to display optical illusions.

The student learns how to operate the computer, and the micro runs the experiment. "The nice thing about it is, I didn't have to go in there (and supervise)," says Michael W. Warren, former director of the cognitive psychology lab at Randolph Macon College in Ashland, VA.

Micros are also used to control a variety of experiments. At Loyola University in Chicago the psychology department is interfacing Apples to acoustical apparatus, slide projectors and tape recorders for vision, hearing and other perceptual tests. It automatically stops and starts the recorder and advances slides. The purpose, says program director William A. Yost, is "to provide students with a state-of-the-art look at how experiments are being done."

At the State University of New York (SUNY) at Oswego, the staff is developing an on-line microcomputer laboratory for behavioral research. Students use the micros to measure reaction time in both animals and humans, says Clyde Wolford of the department of psychology, replacing "antiquated equipment" that often was operated manually throughout the experiment. Micros "give much cleaner results" and save time, he adds.

The micros used in the cognitive labs at the University of Nebraska (Lincoln) are portable, so psycho-biology students can take them along on field studies, aiding data collection.

Students at Detroit's Wayne State University are given examples of experiments on the micro, and then use it to design their own, from hypothesis to data collection. Students must acquire a working knowledge of BASIC to complete the course.

All of these projects have been supported in part by the National Science Foundation, which awards grants through the Local Course Improvement Program and the Instructional Scientific Equipment Program. LOCI grants totalled $2.49 million last year and ISEP grants amounted to $2.7 million. Almost a quarter of those involved microcomputers, which are also being used in chemistry, physics, sociology, economics and geography courses.

Contributed by Betty Thayer, *Microcomputing* magazine

The Hazards of Videotext

People like videotext services and are willing to pay for them, a report from the Online Computer Library Center concludes in the wake of its Channel 2000 experiment last year. But the report also warns that such services may have considerable impact on American culture and society.

"Overall styles of use of information may change significantly in conformity with the strengths and weaknesses of videotex," the report says. "Such changes could have profound effects on our basic forms of social interaction."

And although the study says that "no clear evidence" emerged from the Channel 2000 experiment, "Conceivably, self-education, community awareness, and interpersonal communications at short range (say, within the family or at work) will be affected, either positively or negatively."

The OCLC, based in Dublin, OH, conducted its viewdata experiment in nearby Columbus last October through December. Some 200 participants used a keypad and TV decoder to access a number of videotext services over their telephone lines. These included a public library catalog, the *Academic American Encyclopedia*, a community calendar, home banking and several children's education programs.

Channel 2000 also offered a public information service, which included information on employment, human services,

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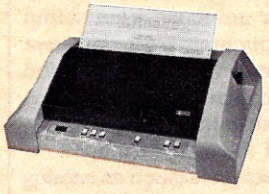

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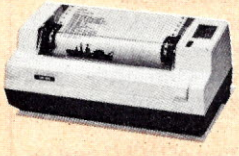

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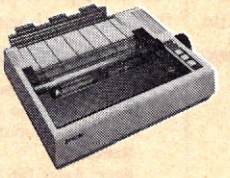

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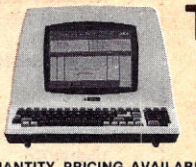

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parks, public utilities, sports, taxes and voting eligibility in the Columbus/Franklin County area.

The OCLC is a computer library service and research organization. Some 2500 libraries use the OCLC network to acquire and catalog library materials, order catalog cards and arrange interlibrary lending.

The report says that participants found the video catalog and the public information service to be the most useful. This was followed by banking services and the video encyclopedia.

When asked which services they would most likely be willing to pay for, users chose the encyclopedia and video catalog first and second, followed by home banking, public information, the Columbus calendar and the education programs.

Some 17 percent said they would be willing to pay between $10 and $15 per month for Channel 2000 as is, while about 80 percent indicated "a moderate-to-high purchase probability" at $15 a month for an expanded service that might include such features as catalog shopping, adult self-education, household energy control, home security and video games.

What kind of person wants videotext?

"People most interested . . . tend to be young, well-educated and affluent," the report says. "They seek stimulation through the acquisition of new products and ideas, and tend to participate in a variety of leisure activities. Their active schedules predispose them toward products that can save them time. They are 'information hungry,' and they are heavy library users."

These demographics are encouraging to videotext marketing managers, but could lead to serious social problems. Videotext, says the OCLC report, could create "a new kind of poverty . . . a lack of options created by lack of informational resources. Will there be new federally funded programs for the informationally disadvantaged or an information stamp program to help maintain parity between the affluent informed early adopter and the rest of the population who have less convenient access to information?"

Other points of the report include:

- "Transaction services (such as catalog shopping and bill paying) will be the foundation of successful viewdata businesses."
- "The market will support a wide variety of information services once 10 to 15 percent penetration is reached."
- "Print will play an ever-diminishing role in the generation and dissemination of 'hot' ephemeral information."
- "Community-oriented services are difficult for a large national viewdata system to provide. However, they lend themselves to the existing public library form."

(For a full description of OCLC and its services, see "Quiet—Computers in the Library" on page 58 of this issue.)

Database Suppliers

- **CompuServe Information Service;** national
  Medium: Telephone
  Format: Computer
  Users: 10,000
  Start date: Nov. 1979
- **Dow Jones News/Retrieval Service;** national
  Medium: Telephone
  Format: Computer
  Users: 18,000
  Start date: 1980 (consumer market)
- **Dow Jones—Park Cities;** Dallas TX
  Medium: Cable TV
  Format: Computer
  Users: 200
  Start date: 1980
- **Dow Jones;** Danbury, CT
  Medium: Cable TV
  Format: Antiope
  Start date: 1981
- **Source Telecomputing—The Source;** national
  Medium: Telephone
  Format: Computer
  Users: 10,000
  Start date: June 1979

Cable TV Operators

- **Warner Amex—QUBE;** Columbus, OH
  Medium: Cable TV
  Format: TV set
  Users: 10,000
  Start date: 1977
- **Cox Cable—Index;** San Diego, CA
  Medium: Cable TV
  Format: TV set
  Start date: 1981

Newspapers, Magazine Publishers

- **Knight Ridder—Viewtron;** Coral Gables, FL
  Media: TV and telephone
  Format: Viewdata
  Users: 160, 84
  Start dates: July 1980 and Jan. 1981
- **Time;** Albany, NY
  Media: Satellite and cable
  Format: Telidon
  Users: 100
  Start date: Late 1981
- **Time;** Orlando, FL
  Medium: Cable
  Format: Telidon
  Users: 200
  Start date: Late 1981
- **Times-Mirror;** Los Angeles, CA
  Media: Cable and telephone
  Format: TV set
  Start date: 1981
- **Times-Mirror;** Los Angeles and Orange Co.
  Media: Cable and telephone
  Format: Telidon
  Users: 200
  Start date: 1981
- **A.H. Belo—Park Cities;** Dallas, TX
  Medium: Cable
  Format: Computer
  Users: 200
  Start date: 1981
- **WFLD-TV/Field Enterprises;** Washington, DC
  Medium: Broadcast TV
  Format: Ceefax
  Users: 100
  Start date: 1981

Over-the-Air TV Broadcasters

- **ABC/NBC/CBS—Captioning for the deaf;** national
  Medium: Broadcast TV
  Format: TV, vertical band interval, line 21
  Users: 30,000+
  Start date: 1971
- **CBS/PBS—KNXT/KCET;** Los Angeles, CA
  Medium: Broadcast TV
  Format: Antiope
  Users: 100
  Start date: 1981
- **KSL-TV;** Salt Lake City, UT
  Medium: Broadcast TV
  Format: Ceefax
  Start date: June 1978
- **Aternate Media Center and PBS—WETA-TV;** Washington, DC
  Medium: Broadcast TV
  Format: Telidon
  Users: 64
  Start date: Mid-1981

AT&T

- **Electronic Yellow Pages;** Albany, NY
  Medium: Telephone
  Users: 75
  Start date: 1979
- **Viewtron;** Coral Gables, FL
  Media: Cable and telephone
  Format: Viewdata
  Users: 100 and 84
  Start dates: July 1980 and Jan. 1981

Others

- **Online Computer Library Center—** Project 2000; Columbus, OH
  Media: TV and telephone
  Users: 200
  Start date: Oct. 1980
- **University of Kentucky—Project Green Thumb;** Kentucky
  Media: CRT and telephone
  Users: 200
  Start date: 1980
- **Professional Farmers of America—Instant Update;** national
  Media: Computer and telephone
  Start date: 1980

Fig. 3. Summary of U.S. videotext trials and operations. (Source: International Resource Development, Inc.)

The Rocky Road to Success

Meanwhile, a study by the International Resource Development Corp. says that the way for videotext is not yet free and clear.

"It will take some digging, and shifting of priorities to find the money to support the video habit," the IRD says.

But the IRD goes on to say that the rewards could be substantial: "If Americans accept videotex into their homes with the enthusiasm with which they accepted television and pay-cable, they will find ways to come up with the time and the billions to make the new media an exciting business opportunity for large numbers of vendors."

Subscribers will pay an average of $78 a month per household by the end of the decade, says the study, for such videotext services as video games, shopping

and banking at home, home security and electronic mail.

"Even if only 10 percent of U.S. households decide to subscribe to these services, their total spending will exceed $9 billion," the IRD concludes.

Other points made by the study include:

- AT&T will be a major manufacturer of videotext terminals.
- All color TV sets will be fitted for teletext by 1985, and by 1991 virtually all U.S. homes will have teletext capability "if only by default."
- Companies standing to benefit from videotext include Dow Jones, Time, Inc., Mattel and Atari.

The report is based on interviews with executives in companies currently sponsoring videotext trials (see Fig. 3).

Jam on the Sheepskin

Readers of the British magazine *Microcomputer Printout* are treated monthly to a gossip column called "Inside Stories," which is marked by its acerbic wit and uncompromising opinions. Here, for example, is what the author has to say about the Interlude porno program:

"Right thinking people will join me in condemning David Low and ACT for their decision to import the pornographic Interlude program. Naturally I felt it my duty to investigate this outrage personally. The program starts by asking a series of very personal questions before prescribing various 'interludes.' In the interests of science, and with the greatest distaste, Mrs. Trader and I sampled interludes Nos. 63, 21, 84, 115 & 222. If anyone knows a cure for exhaustion and a way of getting jam off sheepskin, I will gladly send them my copy of this disgraceful program."

And on Adam Osborne:

"Initial elation that his *PET/CBM Personal Computer Guide* was being considered for the National Book Award wore off rapidly once it was learned that it had been nominated for the fiction category. A spokesman described the chapter on relative data files as a masterpiece of imagination."

Computer Lore

The first annual *Compendium of Common and Uncommon Computer Lore*, a resource guide aimed at the educational computing audience, is now available from *Classroom Computer News*.

The *Compendium* includes information on hardware and software vendors, publishers, degree programs, associations, user groups, books, resource centers and consultants. It also features articles on such topics as choosing a microcomputer, evaluating software, writing and marketing software and computer languages.

The Compendium is $5, and is available from *Classroom Computer News*, PO Box 266, Cambridge, MA 02138.

He Blew a Disk

The following was the lead to an article entitled "Microchip Madness" in the June issue of *Focus* magazine:

"One night last October, in the Silicon Valley town of Los Gatos, a terrified computer programmer fought off a relentless siege of rats and machines. Armed with two 12-gauge shotguns, a .22 caliber rifle, a .25 caliber pistol and a large stockpile of ammo, he blasted away at the menacing invaders.

"Six hours and 30 tear gas cannisters later, a SWAT team managed to subdue the 52-year-old IBM employee. But by that time he had shot up his television, telephone, stereo and virtually every other electrical device in his home, as well as the walls, ceiling and floors, where he believed the enemy rats were hiding. 'He said he was being attacked by rats and machines,' a local police officer reported."

↙See List of Advertisers on page 242

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Pick a strong partner

A computer purchase is the beginning of a long term partnership between you and the people you buy from. Your ongoing need for software and accessories requires a partner who will stand by you with a growing line of products. And nowhere will you find a more complete line of hardware, software and accessories than at your Heathkit Electronic Center. Here are twelve strong reasons to make Heath/Zenith your partner.

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The heart of the Heath/Zenith line is the stand-alone *89 Computer.* It's a complete system with built-in 5¼-inch floppy disk drive, professional keyboard and keypad, smart video terminal, two Z80 microprocessors, and two RS-232C serial I/O ports. It comes with 16K RAM, expandable to 64K.

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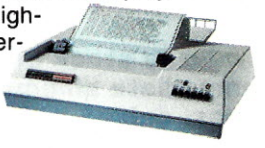
These include the popular *Heath/Zenith 19 Smart Video Terminal,* loaded with professional features. And the *14 Line Printer,* priced as low as $495. Other printer brands are on display, including high-speed, typewriter-quality printers.



3. Software

Word processing, includes reliable, easy-to-use Zenith Electronic Typing and powerful, full-featured WORDSTAR.

Small Business Programs, feature General Ledger and Inventory Control.

HUG, Heath Users' Group, offers members a library of over 500 low-cost programs for home, work or play.

4. Programming Languages

For your own custom programs, Microsoft languages are available in BASIC (compiler and interpreter), FORTRAN and COBOL.

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Three versatile systems give you the capability to perform your specific tasks.

CP/M by Digital Research makes your system compatible with thousands of popular CP/M programs.

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HDOS, Heath Disk Operating System gives you a sophisticated, flexible environment for program construction, storage and editing.

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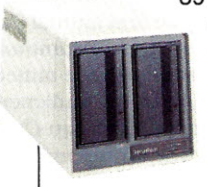
Expand the performance range of your computer with a broad selection of utility tools, including the best of *Digital Research* and the complete line of innovative *Softstuff* products.

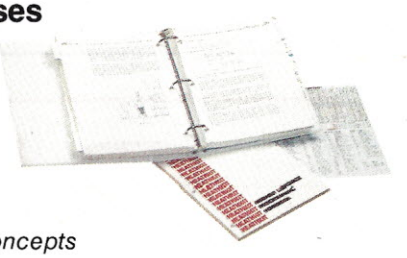
7. Disk Systems

The 8-inch Heath/Zenith 47 Dual Disk System adds over 2 megabytes of storage to your 89 Computer. Diskettes are standard IBM 3740 format, double-sided, double-density.



The 5¼-inch 87 Dual Disk System adds 200K bytes of storage to your 89. Both disk systems feature read/write protection and easy plug-in adaptability.

8. Self-Study Courses



Learn at your own pace with *Programming Courses* that teach you to write and run your own programs in Assembly, BASIC, Pascal or COBOL.

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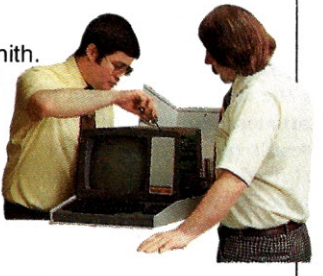
Your Heathkit Electronic Center has the latest in modems, black-and-white and color video monitors, computer furniture and a full line of supplies, accessories, books and parts.

11. Service

No one stands by you like Heath/Zenith. We help you get your system up and running smoothly. Service is available from trained technicians, over the phone or at one of 56 Heathkit Electronic Centers.



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Your money buys you more because Heath/Zenith prices are among the industry's most competitive. Make your own comparison and find out how much you can save.

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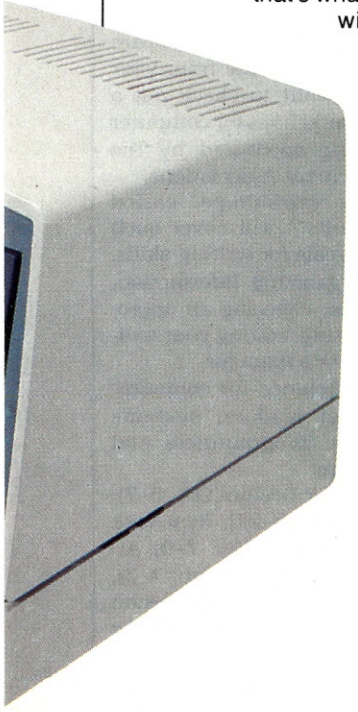

All at your Heathkit Electronic Center

Pick the store nearest you from the list at right. And stop in today for a demonstration of the Heath/Zenith 89 Computer System. If you can't get to a store, send $1.00 for the latest Heathkit® Catalog and the new Zenith Data Systems Catalog of assembled commercial computers. Write to Heath Co., Dept. 351-824, Benton Harbor, MI 49022.

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See List of Advertisers on page 242

By Eric Maloney

Micro-Madness

Prefixes Punctuate Language

It's a compulsion. Give a microcomputerist a noun, and he'll stick "micro-" on the front of it.

Take, for example, *Microcomputing*'s master address list of companies and stores. Some 200 of them begin with "Micro," not including those with the word Microcomputer in their names. They include Micro Architect, Micro Bus, Micro Design, Micro Finance Systems, Micro Magic, Micro Mail, Micro Plaza, Micro Solutions, Micro World, Micro-Madness, Microbiz, Microlog, Microphysics, Microprinters, Microsignal and Microware.

This microhabit is apparently not confined to the microfield of microcomputers. Tracy Kidder's marvelous book *The Soul of a New Machine*, which describes the development of Data General's Eagle minicomputer, includes a humorous micro paragraph on the micro phenomenon:

"To almost everything they touched, the Microteam attached their prefix. The office that four of them shared, sitting virtually knee-to-knee, had a sign on the door that said THE MICROPIT; the room in which they held their weekly meeting was the microconference room. They gave out microawards, and Carl Alsing had his microporch. One of them owned a van, which became the microbus. . . . Then, in the first warm days of spring, they created the outdoor microlounge."

Microcomputing is as guilty as anyone—witness our Micro Quiz and Micro-Scope features. The urge is almost overwhelming. When we launched Walter Koetke's Computer Blackboard column, for instance, the first suggested title was Micro Education. And this column could very easily have become Micro Lingo.

Is there no end to it? If the trend continues, and if humankind is as inextricably altered by microcomputers as some people predict, we might see the genesis of a new species of man—*Micro sapiens*. It would be the next logical step in the micro-evolutionary microprocess.

*****

In case you missed it (I would have, if someone hadn't sent me a photocopy), a William Safire column earlier this year takes direct aim at that overworked word, mode. He quotes a General Foods manager as stating that "some management levels were initially terrified, but now it's settled into a wait-and-see mode." And Chief of Naval Operations Thomas Hayward is caught declaring that the all-volunteer army "is gradually slipping into a failure mode."

Safire traces the word from music to grammar to statistics, geology and physics. But he doesn't mention computerdom, in which "mode" is used frequently, usually to indicate "a method of operation, e.g., the binary mode, the interpretive mode, the alphameric mode, etc." (Charles J. Sippl in the *Computer Dictionary and Handbook*.) From here, the word is easily applied to human functions: an author gets into a writing mode, a computerist says that he has found his programming mode, and so on.

What does Safire think about this? Not much:

"'Mode' could now use a rest," he says. "'Slipping into a failure mode' is an admiral's jargon for 'failing.' Whenever a scientific term is embraced by jargonauts, the parameters are stretched beyond recognition. Let us return 'mode' to fashion, and to the large dollop of ice cream that lands squarely on top of the pie."

*****

Peculiar-Turns-of-Phrase Department: The Land, an Australian periodical, states that "Australian pig raisers are almost ready for the launching of electronic pig marketing." Robotic livestock—an idea ahead of its time. . . .

*****

One of the more distasteful terms to pass through our office in a while is being perpetrated by MIT's Center for Information Systems Research—many-to-many communication.

"When computer storage and branching capabilities are used to filter communications so as to better match personal interests, then one-to-one electronic mail and one-to-many mass media become less significant than interactive media—that is, many-to-many communications," says an abstract of the Center's report, titled, unfortunately, "Many-to-Many Communication."

It's an awkward term for a fairly ordinary idea, and should have been left to perish quietly on a dusty shelf somewhere in the innards of MIT. But the folks there decided to make it the foundation for an entire way of thinking. They go on to describe the forms of M-t-M communication—including inquiry networking, dialogue balloting and interactive graphics—and refer to such things as many-to-many technologies and many-to-many R&R people.

We already have many, too many terms inhibiting many-to-many communication. Why do we need to confuse matters with new ones?

With luck, MIT's new linguistic toy will remain in the already jargon-laden world of academia, where it belongs.

*****

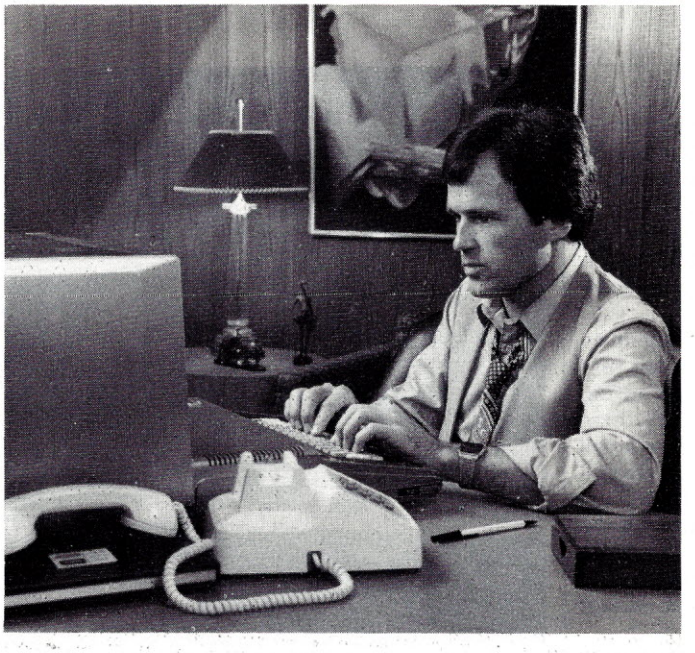
If you've got about 600 bucks to spare (or can pry the money loose from your boss), you might want to check out a series of writing workshops for computer professionals being sponsored by the American Management Associations.

The three-day workshops, called "Writing for Results," will cover such topics as setting goals for writing skills, gathering and organizing information, writing procedures, choosing an appropriate style for writing, editing your writing and writing user's manuals.

The course is designed for computer managers, project leaders, systems analysts, auditors, programmers and project team leaders.

Sessions are set for Boston (Oct. 5–7), Springfield, VA (Oct. 19–21), New York (Nov. 4–6), San Francisco (Dec. 7–9), Atlanta (Jan. 18–20), Phoenix (Feb. 1–3), New York again (Feb. 17–19) and Boston again (March 15–17). It costs $575 for AMA members and $660 for nonmembers.

For more information, write to the AMA, 135 West 50th St., New York, NY 10020.□



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Standard & Poor's General Information File: selected items of information from S&P's NYSE, ASE, and OTC Stock Reports on over 3,000 corporations.

Financial pages of major regional newspapers: electronic editions of major daily newspapers including The Washington Post, The New York Times, The San Francisco Chronicle, plus the AP financial wire.

Raylux Financial Advisory Service: business outlook, financial commentary, stock market outlook, securities glossary and industrial outlook model.

Value Line Data Base II: CompuServe provides access to fundamental financial information on more than 1,700 public companies.

Fintol: personal financial programs.

How much does it cost?
The basic charge is $5.00 an hour from 6 PM to 5 AM local time weekdays, and all day weekends—billed in minutes to your charge card. MicroQuote, Standard & Poor's and Value Line are extra cost options. You can access the CompuServe Information Service with a local phone hook-up from more than 260 U.S. cities. For hardware you need a terminal or personal computer and a modem.

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Along with the financial services, you get all the rest of the CompuServe Information Services: AP news and sports wires, electronic editions of major daily newspapers, games, electronic encyclopedia, government publication data, travel information, valuable consumer and home-related information, entertainment features, electronic mail, nationwide bulletin board, newsletters from computer manufacturers—and more!

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LETTERS TO THE EDITOR

More on VDTs

It is, of course, always refreshing to see articles on the darker sides of computers and computing ("VDTs: Are They Hazardous to Your Health?" *Microcomputing*, July, 1981) because I'd hate to be having all this fun only to end up with cancer, cataracts, emotional instability, headaches, etc.

There are alternatives to staring into a hot CRT/VDT all day. Paper is not very expensive, and has the additional advantage of instantly dumping everything you do onto hard copy. This is no small advantage to programmer productivity. I code on coding sheets rather than on the tube because as I progress through the program all of it is instantly accessible without remembering approximately what line number something was on, and then waiting for the display.

The other alternative that flashes across my mind is to look at the video screen through a reflector, such as a mirror. The IBM 5252 uses this idea but I suspect the reason is money, as the screen is divided between two users.

At any rate, the problem must be put into perspective. Living here in southeastern Connecticut, I breathe all sorts of garbage and drink all sorts of filth, and yet have no intention of moving. The capabilities of the mainframe I use at work are a joy to behold and I have no intention of switching to some other company's computer just to get mirror images. But I hope some masterminds continue to work on the problem and I thank you for the article.

Russell Hoffman
Bridgeport, CT

Tiger's Catcher

I own a Paper Tiger 460 printer and have noticed an annoying characteristic in the paper handling procedure. The paper leaves the top of the machine and then drops back onto the paper going into the printer. The problem is that the paper can be pulled back through the printer, subsequently jamming near the printhead.

I was walking around our storage room at work when I stumbled across the ideal paper catch for my Tiger! I reached down and picked up a standard 98 cent paint roller tray. I punched four holes in the aluminum with an ice pick and stuck two L brackets on the bottom. I then mounted it to the exisiting thumb screw studs on the Tiger. The tray is even deeper on the far end making the paper hit its wall and begin auto folding. See Photo 1.

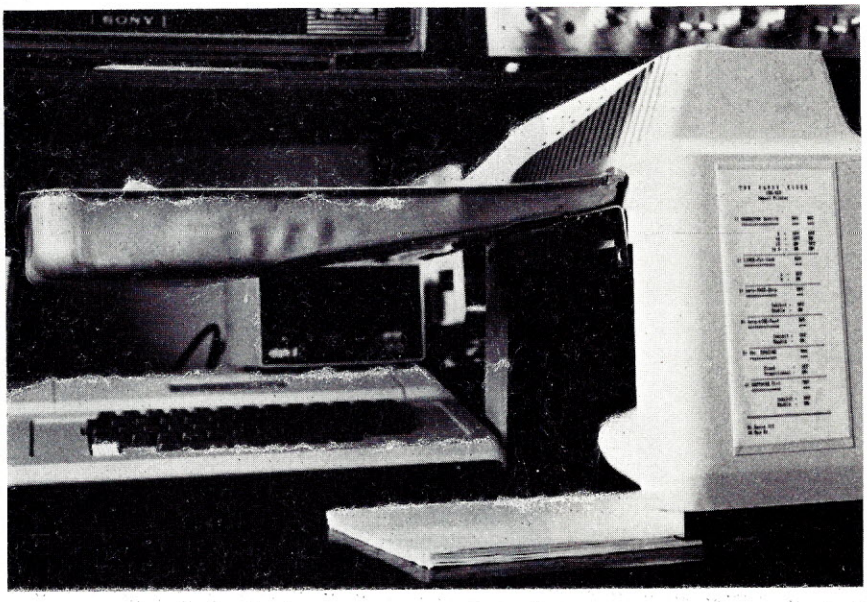


Photo 1. A paper catcher for the Paper Tiger.

For 98 cents and a dollar's worth of hardware one could have a very handy addition to the magnificent Tiger!

Capt. Silas E. Davis III
St. Augustine, FL

Burning Curiosity

I have been a research scientist and believe that research, enquiry and burning curiosity need to be encouraged for empires and civilizations to prosper and survive.

For these reasons I applaud your editorial policy on the astrology article (*Microcomputing*, March 1981).

I believe that all areas are valid for research and enquiry, including areas which are loaded with superstition. (At least the superstition that it's unlucky to walk under a ladder is true; a lot of superstitions probably are not.)

Professor Eysenck of England is, I believe, investigating the correlation of the exact position of the planets at the moment of birth and the personality of individuals. His methods and results in other areas are very controversial but he is a recognised scientist and the program in your article is very relevant to any enquiry of the type he is undertaking.

So please publish articles which spark controversy and enquiry.Long may your circulation prosper!

Stephen Buttery
Mount Waverly, Victoria
Australia

The 6809 vs the 68000

We at Digital Acoustics have been using the 6502 since 1976 in various instruments, primarily battery-powered noise level meters, or environmental noise monitors.

I am sure that we are not alone in seeing that the 6502 is approaching the end of its useful life. We are astonished that some persons see the Motorola 6809 as the 6502 successor. Perhaps these persons are unfamiliar with some of the characteristics of the 6809. For example, to perform a 32-bit add it is necessary to perform the usual succession of four LDA, ADC, STA sequences since the 16-bit add in the 6809 is not an add with carry. Further, the above sequence will run more slowly than a 6502 at the same clock speed because the 6809 is not pipelined and therefore requires four clocks for a zero page reference as opposed to three for the 6502.

(continued on page 243)

THE NATIONAL COMPUTER SHOWS

HAVE WE GOT A PROGRAM FOR YOU IN '81 & '82

Attend the biggest public computer shows in the country. Each show has 100,000 square feet of display space featuring over 50 Million Dollars worth of software and hardware for business, industry, government, education, home and personal use.

You'll see computers costing $150 to $250,000 including mini and micro computers, software, graphics, data and word processing equipment, telecommunications, office machines, electronic typewriters, peripheral equipment, supplies and computer services.

All the major names are there including; IBM, Wang, DEC, Xerox, Burroughs, Data General, Qantel, Nixdorf, NEC, Radio Shack, Heathkit, Apple, RCA, Vector Graphic, and Commodore Pet. Plus, computerized video games, robots, computer art, electronic gadgetry, and computer music to entertain, enthrall and educate kids, spouses and people who don't know a program from a memory disk.

Don't miss the Coming Of The New Computers—Show Up For The Show that mixes business with pleasure. Admission is $5 for adults and $2 for children under 12 when accompanied by an adult.

Ticket Information

Send $5 per person with the name of the show you will attend to National Computer Shows, 824 Boylston Street, Chestnut Hill, Mass. 02167. Tel. 617 739 2000. Tickets can also be purchased at the show.

THE MID-WEST COMPUTER SHOW

CHICAGO
McCormick Place
SCHOESSLING HALL
23rd & THE LAKE
THURS-SUN
SEPT 10-13, 1981
11AM TO 7PM WEEKDAYS
11AM TO 6PM WEEKENDS

THE MID-ATLANTIC COMPUTER SHOW

WASHINGTON, DC
DC Armory/Starplex
2001 E. CAPITAL ST. SE
(E CAP. ST. EXIT OFF I 295 -KENILWORTH FRWY)
ACROSS FROM RFK STADIUM
THURS-SUN
SEPT 24-27, 1981
11AM TO 7PM WEEKDAYS
11AM TO 6PM WEEKENDS

THE NORTHEAST COMPUTER SHOW

BOSTON
Hynes Auditorium
PRUDENTIAL CENTER
THURS-SUN
OCT 15-18, 1981
11AM TO 7PM WEEKDAYS
11AM TO 6PM WEEKENDS

THE SOUTHEAST COMPUTER SHOW

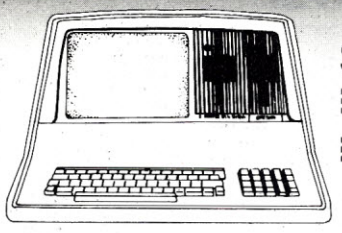
ATLANTA
Atlanta Civic Center
395 PIEDMONT AVE NE AT RALPH McGILL BLVD
THURS-SUN
OCT 29-NOV 1, 1981
11AM TO 7PM WEEKDAYS
11AM TO 6PM WEEKENDS

THE SOUTHERN CALIFORNIA COMPUTER SHOW

LOS ANGELES
LA Convention Center
1201 SOUTH FIGUEROA
THURS-SUN
MAY 6-9, 1982
11AM TO 7PM WEEKDAYS
11AM TO 6PM WEEKENDS

See List of Advertisers on page 242

The Choice



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Superbrain 64K Double Density	**$ 2549**	**28%**
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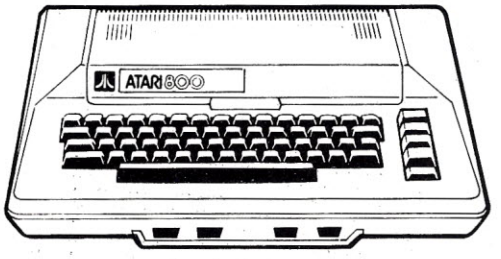

ATARI® 800 16K $739
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ATARI®

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Atari 410 Program Recorder	$ 59
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Atari 850 Interface	$ 159
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Apple Writer	$ 59	21%
The Controller	$ 495	21%
Apple Pilot	$ 119	27%
DOS Tool Kit	$ 59	22%
Apple Fortran	$ 149	25%
Apple Plot	$ 49	30%
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Dow Jones News & Quotes	$ 69	28%
Dow Jones Portfolio Eval.	$ 45	10%
Personal Software:		
Visicalc 3.3	$ 149	25%
Visiplot	$ 129	28%
Visitrend/Visiplot	$ 179	31%
Visidex	$ 139	30%
Visiterm	$ 109	27%
Desktop Plan II	$ 159	21%
CCA Data Base Mgt.	$ 79	20%
Zork	$ 29	27%
Muse, Super Text II	$ 109	27%
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Hayden, Sargon II (chess)	$ 29	22%
PFS, Filing/Data Base	$ 69	28%
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Softech, Stockfile (inventory)	$ 299	35%
Microsoft (on disks):		
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Olympic Decathalon	$ 19	24%
Cobol 80	$ 559	25%
Wordstar	$ 269	24%
Epson, MX 80 Graphics Dump	$ 7	30%
Insoft		
★ ALD System II	$ 110	10%
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A full professional quality integrated GL, A/R, A/P, Payroll package. Hot-line support available. Send for free sample printouts.

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Copy II Plus, *Best bit copier available. Will copy most copy protected software for your backup in 45 seconds!*	$39.95	

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Computer Exchange

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# of Professionals

REPAIR DEPARTMENT (503) 772-4401

HARDWARE for Apple II/II+

		SAVE
Disk II and 3.3 Controller	$ 499	23%
Disk II only	$ 429	18%
Micro-Sci 5″ Drives for Apple II:		
* A70, 286K, 5″ Drive	$ 489	20%
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Apple, Language/Pascal System	$ 369	25%
M&R, RF Modulator	$ 22	27%
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SANYO: 9″ B&W	$ 159	32%
12″ B&W	$ 210	33%
12″ Green	$ 259	25%
* **NEC** 12″ Color	$ 399	30%
12″ Green	$ 225	21%
DISKETTES, 5″, box of 10:		
Apple	$ 44	21%
Maxell	$ 39	33%
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Apple, Game Paddle	$ 25	20%
GSC Videostick, Joystick	$ 35	20%
Keyboard Company: Joystick II	$ 39	22%
Numeric Keypad	$ 119	21%
ABT, Keypad B, 10 key	$ 99	21%
SSM AIO, Serial/Para. Interface	$ 159	20%
CCS: Serial Interface Card	$ 129	35%
Parallel Interface Card	$ 99	37%
Apple, IEEE-488 Card	$ 339	25%
Apple, Clock/Calendar Card	$ 239	15%
80 Column Video Cards:		
Apple, Smarterm	$ 299	17%
* **Videx,** Videoterm	$ 249	18%
Ask about other Videx accessories		
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Apple, Silentype w/Interface	$ 329	17%
Centronics, 737	$ 759	26%
Apple, Centronics 737 Interface	$ 149	33%
* **Epson:**		
MX 80	CALL	CALL
MX 80 FT	CALL	CALL
MX 100 W/Graphics	CALL	CALL
MX 80/100 Interface	CALL	CALL
MX 80 friction feed adapter	CALL	CALL
MX 80 graphics chip	CALL	CALL
MISCELLANEOUS:		
Apple, Graphics Tablet	$ 695	13%
Microsoft:		
* Z80 Softcard	$ 249	28%
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* **Hayes:** Micromodem II™	$ 279	26%
Smartmodem	$ 249	11%
* **Apple,** 1 Yr Extended Warranty	$ 175	20%
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We are an authorized dealer and repair center and will repair all Apple equipment regardless of where you purchased it, in or out of warranty. Normally our turn-around time on repairs is 24 hours. Call before sending equipment.

Apple II+		SAVE
16K	$ 1029	23%
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All are 1981 models with Apple RAM. 64K unit is 48K unit with Microsoft 16K RAM board. 64K units include Applesoft and Integer BASIC's when used with DISK II. The Apple II no longer comes with game paddles. Paddles are extra - CALL.

APPLE *III*

128K	$ 3299	SAVE
Disk	$ 479	13%
Info Analyst Pack	$ 399	20%

Above prices for mail orders only. Our store showroom is 259 Barnett Rd., Unit 2, Medford, OR. Store prices, which include software service, differ from mail order prices. No mail order sales at store. CALL ORDER DESK.

ORDERING INFORMATION:

Minimum order $100. Money Orders, Cashier Checks or Bank Wire welcomed. Visa and MC orders add 3%. Net 30 days on credit for *Fortune* 500 companies and companies rated 4A-2 and better by Dunn and Bradstreet. Personal checks are accepted (allow 20 days to clear). Add 3% for shipping, handling and insurance. UPS ground is standard. Add 4% total for UPS Blue or 10% total for foreign orders or US Parcel Post. Include your telephone number. No COD's. Prices are subject to change without notice. Order desk hours are 9 to 6 PDT, 10 to 3 Saturdays.

REFERENCES:

We have been an Apple dealer since 1978. Our bank reference is First Interstate Bank (503) 776-5620. We belong to the Chamber of Commerce. (503) 772-6293.

Computer Exchange

259 Barnett Rd., Unit 3, Medford, OR. 97501

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The Home Information Explosion: A Fizzle or a Bang?

By Eric Maloney
Microcomputing Staff

We hear a lot these days about the so-called home information explosion (or revolution, if you want to be shamelessly hyperbolic). Writers in both the popular and computer presses predict confidently that within a few years, we'll all be tied to one another via a vast network of wires, microwaves, satellites and cathode ray tubes. They tell us that telecommunications is the biggest thing since Gutenberg; that our entire way of life will be transformed; that, in the words of the travelling preacher, "There's a better world a-comin'."

"The home computer will become more than a quick calculator," G. Harry Stine writes in a recent *Science Digest*. "It will be the mailbox, finance center, personal message board, home library and educational tool for adults and children; most important it will be an instant link to the wide, wired world."

"Very soon we will be liberated from more than 100 years of *passively* accepting the information given us, first through newspapers, then radio and now television," chirps another enthusiast. "We will become vital, active, demanding consumers for whom business will have to compete to try to meet our every whim."

Such euphoria is a natural part of any new technological landscape. Those who find themselves part of a pioneer movement become enraptured by the power, the freshness, the potential. They want to share their discovery with others; they want to explore new and unimagined possibilities; they want to prove that their vision will wed the world to a new and better way of life.

> They tell us that telecommunications is the biggest thing since Gutenberg; . . . that, in the words of the travelling preacher, "There's a better world a-comin'."

But as history has repeatedly shown, such a vision quickly chips and fades, like a beautiful painting on cheap canvas. We once had great plans for such modern miracles as atomic energy, the combustion engine and mass production techniques. But a failure to fully understand the possible ramifications of these advances in technology eventually led to serious social, cultural and economic problems.

The dual rise of microprocessor and telecommunications technologies is giving us the chance to make the same mistakes all over again.

To be sure, home information services offer some wonderful possibilities. They *could* enrich our lives through more and better consumer services. They *could* give us a faster and more efficient communications system. They *could* give the average citizen computer and information power hitherto reserved for corporations and governments. The articles in this issue offer glimpses of such potentials.

But these happy predictions are just that—predictions. They won't happen unless people make them happen. And they won't happen without a realistic appraisal of the possible negative impact telecommunications could have on society and culture.

At this point, such analysis is the exception rather than the rule. As is the case with most new technologies, this one has been developed primarily for its own sake. The market is being discovered (or, in some cases, invented) almost secondarily. The rush is on to develop a consumer need—and thus, a growing and profitable industry—with little consideration of what those needs really are, or whether they even exist.

"Whatever the ultimate pattern of home communications, if it follows

past history it will be the result of corporate rivalry among traditional companies protecting their own interests," says media critic Ben Bagdikian in *The Information Machines*. "This rivalry is a useful source of energy in the building of systems, but such companies have seldom been sensitive to those social needs that do not happen to fit their momentary corporate ambitions."

The industry has adopted a familiar Western credo: shoot now, and ask questions later. But in so doing, the real needs of the consumer play second fiddle to those needs which the industry creates to best market its products. This is not a healthy perspective. Says MIT professor Thomas B. Sheridan in *Technology Review:*

"We *will* have our computers, but our subjective sense of what is right, beautiful, and consistent with a just and sustainable society, and what contributes most to human fulfillment, ought to dictate our use of these exotic tools. . . . Productivity in human terms should prevail over productivity in machine terms."

The responsibility for this task does not rest solely with the telecommunications industry. The consumer must protect his own interests. Unfortunately, the average consumer does not understand what computers and telecommunications are all about, and thus tends to ignore their presence. To him, computers, satellites, AT&T and the like are simply "out there," representative of forces over which he has no control, parts of a grand but hazy master plan that will lead us down the road of progress to something called "a better way of life."

The 7 Percent Revolution

We hear that the microcomputer will become a consumer appliance like the TV set or stereo. We hear that the average American home will become a veritable library of information, wealthier than the Library of Congress. But how widespread will this phenomenon be, and who will benefit most from it?

Business Week quotes an AT&T forecast as predicting that eight million homes will have videotext by 1990. This represents an unremarkable 7 percent of the total marketplace. The projection may be on the low side, but the industry doesn't need awesome numbers to make a profit. According to International Resource Development (IRD), 10 per-

Look at What's Available

Following is a random sampling of database and information services now being offered. Fees do not include telephone costs, or costs for accessing through Tymnet or Telenet.

ADP Network Services

Automatic Data Processing, Inc.
175 Jackson Plaza
Ann Arbor, MI 48106
313-769-6800

Services: General timesharing and application programs for business analysis, reporting, forecasting, accounting, financial and investment management, information retrieval, project management, database management, presentation-quality graphics and statistics. Databases include U.S. Macro, business conditions, securities prices, consumer prices, COMPUSTAT, producer prices, EXSTAT, foreign exchange.
Rates: NA.

Bibliographic Retrieval Services, Inc.

Corporation Park, Bldg. 702
Scotia, NY 12302
518-374-5011

Services: Access to major commercially available bibliographic databases, primarily for libraries. Databases include Agricola, Biosis Previews, Dissertation Abstracts, Druginfo, Exceptional Child Education Resources, the National Library of Medicine's MEDLARS (exclusive), the National Technical Information Service, Pharmaceutical News Index, Psychological Abstracts.
Rates: $16–30 depending on amount of use; annual subscription payment; royalty fees.

Chase Econometrics/Interactive Data Corp.

486 Totten Pond Road
Waltham, MA 02154
617-890-1234

Services: Financial and economic databases. Four major categories: fundamental data (information from corporate and institutional financial statements), technical data (prices, earnings, dividends, splits and more information on stocks, bonds and other investment securities), historical economic data (business, financial energy, employment and other indexes and statistics) and forecast economic data (short- and long-term projections with alternative scenarios of business, financial and industrial variables).
Rates: NA

CompuServe Information Service

5000 Arlington Centre Blvd.
Columbus, OH 43220
614-457-8600

Services: Offerings include wire service and newspaper news, family information, financial information, entertainment, electronic mail, personal computing services.
Rates: $5 an hour 6 PM–5 AM weekdays, all day Saturday, Sunday and holidays; $22.50 all other times.

Dialog Information Retrieval Service

3460 Hillview Ave.
Palo Alto, CA 94304
415-858-2700

Services: The largest system of its kind in the world; over 40 million records covering technical reports, conference papers, newspapers, journal and magazine articles, patents and statistical data. Fields covered include science, education, business and finance, current affairs, social sciences, law, medicine, the arts and the humanities. Some 60,000 journals in 40 languages cited.
Rates: "Depending upon the database, a ten-minute search could range in cost from $5–$8 to approximately $15." No minimum fees.

Continued on page 44.

cent of the market will produce some $9 billion in revenues.

As important as the market's size is its profile. IRD predicts that the average subscriber will pay $78 per month for videotext services. This typical subscriber is described in the Online Computer Library Center's report on its Channel 2000 videotext experiment:

"People most interested in purchasing viewdata services tend to be young, well educated and affluent. They seek stimulation through the acquisition of new products and ideas, and tend to participate in a variety of leisure activities. Their active schedules predispose them toward products that can save them time. They are 'information hungry' and they are heavy library users."

From these facts and figures, one clear point emerges: videotext is first and foremost a marketing phenomenon. Its immediate and direct technological impact will be on a relatively small but well-heeled segment of the population, one with more sophisticated information needs than the less affluent, less educated end of the consumer market.

Put simply, this 7 percent revolution is not a revolution for the masses. The required hardware and service expenses may be within the reach of the industry's targeted market, but most middle- to lower-class consumers can afford neither.

The industry is well-aware of where the potential sales are. One need only look at the kinds of services being offered through videotext. Of what use are the stock market quotations to someone who doesn't own stock? What's the point to home banking if you don't have any money in your account, or if you don't even have an account? What good is catalog shopping when you can't even buy enough groceries for the week?

Videotext and database services will not create an "information elite." But they could very well accent the gap between rich and poor, educated and uneducated, that already exists. Those with the ability to access and manipulate information efficiently and effectively will naturally acquire more power, whether it be political, economic or personal.

Most people will initially benefit from videotext and database services through a trickle-down effect: they'll deal with intermediaries who will do the actual telecommunicating. For example, students or public library patrons will retrieve bibliographic information through trained librarians. People will perhaps belong to a civil, social or political organization that will have a terminal in the office for data access. Doctors, lawyers, real estate agents, universities, local governments, cultural organizations, groups active for social change—all will act as liaisons between information services and the consumer.

Computer Proliferation

One popular argument today is that

Continued from page 43.

I.P. Sharp Associates Ltd.

145 King St. West
Toronto, Ontario M5H 1J8
Canada

Services: Databases in five major categories: economics, finance, aviation, energy and insurance. Library includes daily currency exchange rates, Statistics Canada's CANSIM Mini Base data, securities data from U.S. and Canada stock exchanges, the Official Airline Guide, data from U.K. Central Statistics Office. Suppliers include Financial Post, U.S. Civil Aeronautics Board, International Monetary Fund, U.K. Central Statistics Office, American Petroleum Institute. Local access cities in 26 countries.
Rates: NA.

New York Times Information Service

Mount Pleasant Office Park
1719-A Route 10
Parsippany, NJ 07054
201-539-5850

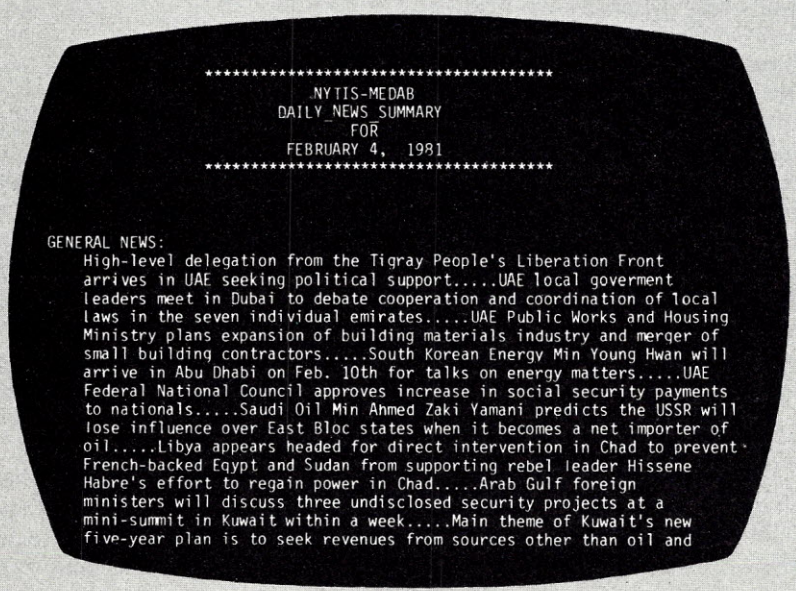
Services: Abstracts from articles that have been published in *The New York Times* and 90 other publications. General circulation newspapers (*Atlanta Constitution, Chicago Tribune, Seattle Times, Washington Post* and others), business publications (such as *Advertising Age, Barron's Journal of Commerce, Wall Street Journal*), science publications (*Astronautics, Bulletin of the Atomic Scientists, Industrial Research*), international affairs (*Economist of London, Far Eastern Economic Review, Japan Economic Journal, World Press Review*).
Rates: $75 an hour.

Rapidata

20 New Dutch Lane
PO Box 1049
Fairfield, NJ 07006

Services: Provides "information processing and consulting services to meet the business needs of its corporate clients in a variety of essential industries." FINSTAT, Demographic Data Base, Telerate II Historical Domestic and International Data Bases, Rapidquote II Securities Data Base, International

Continued on page 45.



A screen from the New York Times Information Service's Middle East database, MEDAB.

people will learn about computers because they have to. They will otherwise fail to survive in this streamlined, chrome-plated, ultra-sophisticated world. In other words, everyone else has got the bomb now, so you'd better get one, too.

This may be true (although not quite to the extent that technophiles would like to believe; the Amish, for instance, are doing quite well, and will not suffer greatly from lacking microcomputers.) Educators have responded by spending a great deal of energy promoting computer literacy courses in schools with lower-income students. But teaching someone a skill is a lot different from giving him a means by which he can use that skill.

A few years back, the U.S. government sent the young men of a number of Indian reservations off to auto mechanics school. The idea was that the Indians—who seemed to have an aptitude for mechanics—would learn how to fix autos, leave the reservations for jobs in the city, and eventually become assimilated into the mainstream of American life. But when the Indians finished their schooling, they went back to the reservations. As a result, these reservations are now swarming with cracker-jack auto mechanics, all still unemployed.

The moral of this story is that you can't slap a skill on someone like a dump permit and expect him to use it in a manner prescribed by your own vision of the world. You can teach someone a skill, but you can't make him use it. You can give someone a library card, but you can't make him read. And you can give someone videotext, but you can't make him use the services.

As the following articles show, the world of videotext and telecommunications is dynamic and vibrant. The full technological possibilities haven't yet been imagined. It is precisely during this time of exploration and excitement that serious questions about the impact of home information services must be raised. And in the process, we must ask what must be done to insure that telecommunications will be responsive to the needs of those currently outside the marketing strategies of the telecommunications and microcomputer industries.

Only then will the home information explosion be more than a show of spectacular, but ephemeral, fireworks in the night.■

Continued from page 44.

Finance Statistics, Citibank's economic database Citibase.
Rates: NA

SDC Search Service

System Development Corp.
2500 Colorado Ave.
Santa Monica, CA 90406
213-820-4111

Services: The Orbit Information Retrieval System. Bibliographic and full-text records of journal articles, patents, books, theses, conference papers, annual reports, maps, contracts, grants, government legislation, hearings, newspaper articles, summaries of research in progress, statistical and tabular data, voting records, reviews. Over 80 databases cover these areas: business and economics, chemistry, engineering and electronics, energy and environment, government and legislation, industry, life science, patents, science and technology, and social sciences.
Rates: NA

The Source

Source Telecomputing Corp.
1616 Anderson Road
McLean, VA 22102

Services: One of the two information services most visible to consumers; geared to home and business use. Over 1000 information and communication services, including UPI news, Unistox market information, Computer Search International employment service, electronic mail service.
Rates: $100 registration fee. Within U.S., $15 an hour prime time, $4.25 an hour non-prime time, $2.75 an hour between midnight and 7 AM.■

Legal Profession—NYTCDB(P0075)
Leo (astrol.)—DATA ASTTRA-1
Libra (astrol.)—DATA ASTTRA-2
Library—DATA LIBALL; POST READ LIBRARY-FORUM
Life (game)—INFO LIFE
Life Styles—NYTCDB(P0076)
Load—Dot-Load (.Load) files into mail; SYSINFO
Loan:
- Installment Interest—R LINTRT
- Amortization, UNK Term— R YRMORT
- Amortization Schedule—R LAMORT

Lofton, John (commty)—UPI F 1143
Louisiana News or Sports—UPI S LA N or S
Lunar Landing (game)—INFO LUNAR

M

Magic—DATA MAGIC
Mail—DATA MAILCALL; MAILCK
Maine News or Sports—UPI S ME N or S
Malino, Emily (home decorating)—UPI F 1273
Management—NYTCDB (P0078)
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Maryland News or Sports—UPI S MD N or S
Massachusetts News or Sports—UPI S MA N or S
Mastermind (game)—INFO MIND
Mathematics—DATA GENMAT
Maze Generation (game)—INFO MAZE
Mean, Computation (stat.)—INFO LTANAH
Mechanical Engineering—DATA MECHEN
Medical—UPI F 1361
Medicare—NYTCDB(P0080)
Mental Health—NYTCDB(P0081)
Merchandise—POST READ MERCHANDISE
Metals:
- NY/London Mkt Prices—UNISTOX (006)
- NY/Chicago Mkt Prices—UNISTOX (122)
- Also see specific metals.

Metric System—NYTCDB(P0082)
Michigan News or Sports—UPI S MI N or S
Midwest OTC Exchange Market—see "Over-the-Counter"
Mind Reading (tricks)—DATA TUNE, DATA SPY, DATA DRAW, DATA SPIRIT
Minnesota News or Sports—UPI S MN N or S
Miscellaneous—POST READ MISCELLANEOUS
Mississippi News or Sports—UPI S MS N or S
Missouri News or Sports—UPI S MO N or S
Mockridge, Norton—UPI F 1163
Molecule Thickness—INFO LMOLEC
Moody's Index—see "Commodities"
Money Market News & Comments
- Futures—UNISTOX (017)
- Opening Lead—UNISTOX (009)
- Noon Lead—UNISTOX (109)
- Afternoon Lead—UNISTOX (099)
- Night Leads—UNISTOX (081)
- Market's At a Glance—UNISTOX (038, 063)
- Stock Pulse—UNISTOX (116)
- Trends—UNISTOX (121)
- What the Market Did—UNISTOX (054)

Money Savers—DATA BUCKS; MONEY
Montana News or Sports—UPI S MT N or S
Mortgage Analysis—INFO MORGAG
Motion Graphs—INFO LFROCS
Movie Reviews—AUTO CINE; UPI F 2790
Moving Plans—DATA TRAVEL; see "Home"; (astrol.) MOVEQUEST
Music—POST READ MUSIC; UPI F 1269
Music Source—MUSICSOURCE
Mutual Funds: Prices—UNISTOX (068) Summaries—UNISTOX (171)

N

National Health Insurance—NYTCDB (P0083)
National News—UPI N
National Parks—NYTCDB(P0084)
Nebraska News or Sports—UPI S NE N or S
Nevada News or Sports—UPI S NV N or S
New Hampshire News or Sports—UPI S NH N or S
New Jersey News or Sports—UPI S NJ N or S
New Mexico News or Sports—UPI S NM N or S
News Focus—UPI F 1413
News Summary—DATA NYTNS; DATA DANEWS
Newspapers—NYTCDB(P0085) (tollfree nos.) TOLLFREE (P089)
Newspaper Enterprise Assn.—UPI F 1301, 1373
New York News or Sports—UPI F NY N or S
New York Stock Exchange: (Also see "Stocks")
- Bonds—UNISTOX (151, 155, 028, 165)
- Dly Prices—UNISTOX (131, 134, 139)
- Wknd: Comp. Prices—UNISTOX (160)

New York Wines—WINE (P015)
Nim (game)—INFO NIM; PLAY NIM2
North Dakota News or Sports—UPI S ND N or S
"Notes on People"—NYTDCB(P0086)
Notes, Treasury—UNISTOX (023)
Nuclear Wastes—NYTCDB(P0087)
Numbers—INFO #123

O

OFF—To sign off SOURCE securely, type OFF in command mode. Then hand up your phone.
Office Equipment—POST READ OFFICE-EQUIPMENT
Ohio News or Sports—UPI S OH N or S
Ohm's Law (stat.)—INFO OHM; INFO OHM2
Oklahoma News or Sports—UPI S OK N or S
Olderman (sports)—UPI F 1405
Operas, Soap—UPI F 1305
Options & Futures (AMEX, CBOE)—UNISTOX (197, 180, 195, 172)
Ordering Merchandise—DATA BUCKS; MONEY
Oregon News or Sports—UPI S OR N or S
Over-the-Counter Exchange Markets:
- Dly: Banks & Insurance—UNISTOX (086)
- Closings (Cmplt.)—UNISTOX (105)
- Gainers & Losers—UNISTOX (182)
- Index, NASDAQ—UNISTOX (077)
- Industrials—UNISTOX (014)
- Wknd: Gainers & Losers—UNISTOX (192)
- NASDAQ, Weekly—UNISTOX (178)

Page from the "Master Index to the Source."

Enter the world of data communications, where you don't have to be in parallel or synchronous to send messages over the phone lines.

How Data Travels

By Thomas W. Parsons

As the world of data communications opens up to the small-systems user, it is going to be important to know how data is transmitted over long distances—from a remote computer or data network to your terminal or local computer.

Data communications for the typical hobbyist or small-business user is generally serial and asynchronous and goes by way of a modem or acoustical coupler at a data rate of 300 bps. If this doesn't make any sense to you, then this article is for you. I'm not going into the details of how a big network is controlled or how messages are switched and routed from point to point, but I'll introduce you to the mechanics of how data in your computer or terminal is transmitted to whatever is at the other end of your phone line.

First, I will clarify a few commonly used terms: serial and parallel, synchronous and asynchronous, half duplex and duplex, bits per second and data rates. Then we will see exactly how serial-data bits are formatted for transmission and will summarize the most commonly used signals and status lines in the RS-232C interface standard. Finally, we will look at modems—devices that transform digital data into signals that can go down phone lines.

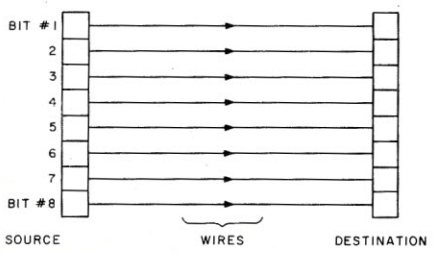

Fig. 1. Parallel data transmission.

Types of Transmission

There are two basic ways in which data can be moved from place to place—serially or in parallel. If you have a chunk of, say, eight bits to be moved from one place to another, you can provide eight wires and connect one bit to each wire, as in Fig. 1. This is a parallel connection. When you have data ready for transmission, you move the bits into the register labeled "source." Then you let your destination know they are ready, typically by means of a pulse, usually called "strobe" or "data valid" or the like. That pulse ultimately makes the destination register look at its inputs and save them.

This kind of transmission happens very fast—it can take only a fraction of a microsecond—but, of course, you have to provide eight data lines. It's cheaper, but slower, to send the bits one at a time down a single line. Fig. 2 shows this serial transfer as it might look in midstream. Here, bits 1–3 have already arrived at the destination, bit 4 is en route, and bits 5–6 are standing in line at the source waiting their turn.

In this type of transmission, the source and destination are usually shift registers. The bits are loaded into the register, the contents move one position to the right. In this way you can put one bit after another onto the line. At the destination, the bits are similarly collected in another shift register.

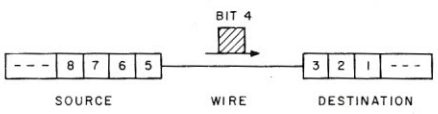

Fig. 2. Serial data transmission.

The choice between serial and parallel is a choice between saving money and saving time. Inside the computer, data is transferred from one central processing unit (CPU) register to another, or between CPU and memory, in parallel, because speed is all-important here. Moving data between the computer and your terminal is done serially. It's easier and less demanding to run a single wire to the terminal instead of eight wires, and even at serial rates the bits move many times faster than you can type or read. It's less safe to generalize in the case of computer networks, but data transmission is almost always done serially.

Synchronous and Asynchronous Transmission

If serial transmission is used, the bits can be transmitted synchronously or asynchronously. In synchronous transmission, all characters are sent at a constant rate and timing is synchronized between transmitter and receiver so the receiver "knows" when each bit and each character is coming. (See Fig. 3.) The synchronization can be done by sending a train of clock pulses on a separate line as shown, or it can be done by providing the receiver with a stable clock of its own, which can be locked onto the incoming pulses themselves. You

Address correspondence to Thomas W. Parsons, 42 Willow Place, Brooklyn, NY 11201.

will notice that all the characters are jammed up against each other, without a break. Clearly, this would never work for a terminal; nobody can type that fast.

In asynchronous transmission, characters can be sent at any time, with any size space between characters (as in Fig. 4), and means are provided to enable the receiver to recognize the start and end of each character. In a typical connection between the home or small-business user and a computer network, transmission will be serial and asynchronous, and for the rest of this article I will talk mainly about this type of data transmission.

Serial-Asynchronous Data Format

I said that with asynchronous data, means are provided to let the receiver know when a character began and ended. This is done by transmitting the data in a standard format, as shown in Fig. 5a.

The format consists of a train of equally spaced pulses. This pulse-train can begin at absolutely any time —for example, it doesn't have to abut or be aligned in any way with the preceding pulse trains—but once begun, the pulses must continue at a steady rate until the character ends.

The format begins with a start bit and ends with one or more stop bits. These bits enable the receiver to recognize the beginning and end of the character. You can't just hit an asynchronous receiver with a serial character without any warning. The start bit gives the receiver a one-bit advance notice. The receiver, when it sees this bit, starts up its local timing and prepares to receive the data bits. The stop bit marks the end of the character and gives the receiver time to digest the character and reset its hardware. At high data rates, where the receiver hardware is all electronic, only a single stop bit is required.

The first terminals were electromechanical, however, using a rotating commutator to carry out the conversion between serial and parallel data. (If you have ever watched an ASR-33 Teletype with its cover off, that's what that big, rotating thing in the back is for.) It was found that the commutator took a little time to come to rest after a character, so most of the slower speeds, dating from the electromechanical era, have more than one stop bit to provide some extra settling time—sometimes two bits, sometimes one and a fraction.

You will see from Fig. 5 that the start bit is a 0 and the stop bits are 1s. Notice also that the idle state of the line is a 1; thus for the stop bits the line simply goes into an idle state for the required number of stop bits and then remains idle until such time as a start bit can be thought of as a "frame" for the bits inside, and in fact the problem of determining which bits correspond to which parts of a character is called framing. If noise pulses or other errors cause the receiver to get mixed up in its timing, we say that a framing error has occurred.

Inside the frame formed by the start and stop bits are the bits of the character. There are various numbers of bits per character, depending on which code you are using. The oldest code, still used in some Teletype-like devices, used five bits per character, the invention of a French engineer named Baudot. There are a few six-bit codes floating around, but none we are likely to encounter. The American Standard Code for Information Interchange (ASCII) code uses eight bits, seven for character codes and one for parity.

In nearly all contemporary applications, however, use standard ASCII code. In any case, the bits are transmitted starting with the least-significant bit (LSB) and ending with the most-significant bit (MSB). This can be seen in Fig. 5b, which shows the transmitted bit pattern for the semicolon character.

After the character bits comes the

Micronet— From the User's End

By Steve Eigsti

The first questions new or potential users of Micronet ask are, "How much?" and "What's in it for me?" The answers are "$5 per hour" and "probably lots." The cost ($9) to join Micronet is inexpensive compared to The Source ($100), but Micronet's hourly charges for using time are about the same as The Source. Micronet's sign-up fee includes a free hour and at least $4 worth of documentation. In both cases, how-

(continued on page 50)

Address correspondence to Steve Eigsti, 1320 Orange Ave., Menlo Park, CA 94024.

Akron, OH	Memphis, TN
Arlington, VA	Miami, FL
Atlanta, GA	Mountain View, CA
Baltimore, MD	New York, NY
Boston, MA	Orange County, CA
Canton, OH	Palo Alto, CA
Chicago, IL	Philadelphia, PA
Cincinnati, OH	Pittsburgh, PA
Cleveland, OH	Princeton, NJ
Columbus, OH	Providence, RI
Dallas, TX	Rancho Bernardo, CA
Dayton, OH	San Diego, CA
Denver, CO	San Francisco, CA
Detroit, MI	San Jose, CA
East Lansing, MI	San Mateo, CA
Fort Worth, TX	St. Louis, MO
Hartford, CT	Stamford, CT
Houston, TX	Toledo, OH
Indianapolis, IN	Tucson, AZ
Kansas City, MO	Van Nuys, CA
Long Island, NY	Waterbury, CT
Los Angeles, CA	West Caldwell, NJ
Louisville, KY	

Table 1. Cities that have Micronet phone numbers.

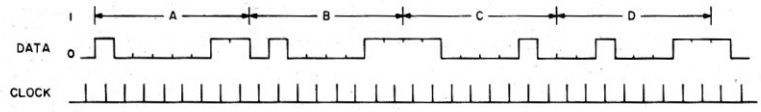

Fig. 3. Synchronous data transmission.

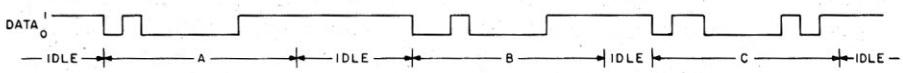

Fig. 4. Asynchronous data transmission.

parity bit. This is an error-checking bit, and it's used as follows. Suppose your character code is 3B hexadecimal, as in Fig. 5b. You will notice that the bit pattern has five 1s in it. Since 5 is an odd number, we say that 0111011 has odd parity. By adding one more bit and setting it to 1 or 0 as required, you can arrange for all characters to have the same parity. The sender and receiver agree to use a particular parity; then the receiver can check for transmission errors by counting up all the 1s in each character, noting whether the total is odd or even, and comparing this with the agreed-upon parity. A parity error indicates that something in the character was transmitted incorrectly.

Full and Half Duplex

Suppose you and I want to set up our own telephone or intercom system. The simplest way to do this is as shown in Fig. 6. In this arrangement, there is one pair of wires strung between you and me; I have a transmitter and you have a receiver. This is called a simplex system, and clearly it's not of much use—at least, not if you want to talk back to me. The arrangement in Fig. 7a is much nicer. Here we have two simplex connections back-to-back and can carry on a decent conversation. This connection is called a duplex system, or sometimes a full-duplex system, for reasons that will be clear in a minute.

Of course, it's expensive to run four wires for every telephone connection, so some clever fellow at the telephone company invented a thing called a hybrid. A hybrid can tell whether any particular signal is outgoing or incoming, and using it we can get by with only one pair of wires, as shown in Fig. 7b, even with both voices on the line simultaneously.

All telephone connections for voice communication are full duplex, and most of them are two-wire. Data transmission over voice-grade lines is also full duplex, and this is the kind we're mostly interested in here. But there is another arrangement you should know something about—the half-duplex connection, shown schematically in Fig. 8.

In this arrangement, I can talk to you, or you can talk to me, but we can't talk simultaneously. Switches S1 and S2 are not necessarily physically found in our terminals, but they symbolize a control problem the data link has with this kind of connection: the link has to reverse the sense of any relays or amplifiers along the line every time the direction of transmission changes. (Telephone engineers call this "turning the line around.") You will see later that it is up to the users to tell the data link when this is to be done.

Among commercial data links, the ones that are half duplex run at higher speeds than we are talking about here. In timesharing over voice-grade lines, they occasionally talk about setting your terminal to half duplex, but this has a slightly different significance, which I will explain later, after I have talked about modems.

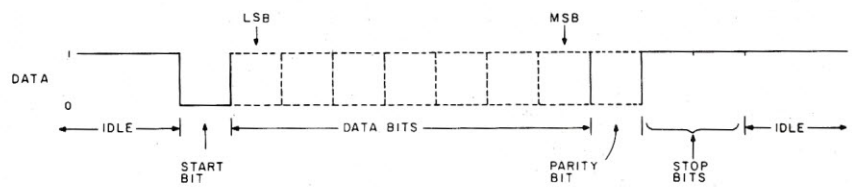

Fig. 5a. Asynchronous data format.

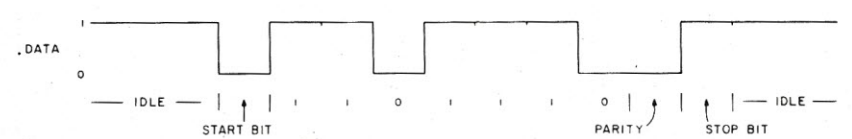

Fig. 5b. The semicolon character ";" (whose ASCII code is the binary representation of the hexadecimal 3B) transmitted with odd parity and one stop bit.

Transmission Rates

As you might guess, there have been several kinds of transmission systems employing a variety of rates. The subject is somewhat complicated by the fact that there is some confusion about the terms used to describe transmission rates. Let's deal with that first, then look at the principal rates in use today.

The rate at which data is transmitted or received is called, oddly enough, data rate. Data rate is measured in bits per second (bps), or the number of bits that are being communicated in a second. The terms baud and baud rate are often used, somewhat inaccurately, in place of bps and data rate. (A few authors have further confused the issue by trying to define baud rate and data rate as two different but related measurements. In fact, for technical reasons, they are different but not for the reasons proposed by these authors and not really related. Baud is a term used accurately in telegraphy and has been carried over into Teletype-like communications. It is not accurately used with the type of computer-based serial data communication with which we are dealing.)

Microcomputer-based communications data rates commonly encountered are 150, 300, 600, 1200, 2400, 4800 and 9600 bps. Other data communication devices operate at different rates (e.g., Teletype-like devices generally are restricted to 100 bps which for them is equivalent to 10 characters per second), but these need not concern us here.

In a half-duplex or full-duplex connection, both terminals operate at the same rate. Occasionally there are arrangements in which one channel, called the primary channel, runs at a significantly faster rate than the other, secondary, channel. This is done, for example, as a modification of half-duplex transmission, where the secondary channel enables the receiving station to interrupt the transmitter. I have never come across a timesharing system or consumer data network that had a secondary chan-

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BY LEO CHRISTOPHERSON

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The RS-232C Serial Interface Standard

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The local connection between your modem and your computer is governed by the Standard RS-232C of the Electronic Industries Association (EIA). Such a device is usually referred to as an RS-232C serial interface. (The older 20 mA current loop is rarely found and will not be discussed.)

The standard does two basic things. It defines the electrical characteristics of the data transmitting and receiving circuits (including the voltage levels that represent 0 and 1), and it provides a menu of useful data and status signals. The standard is very

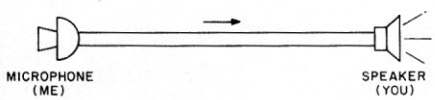

Fig. 6. Simplex telephone circuit.

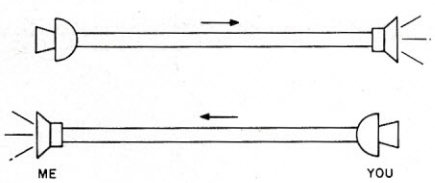

Fig. 7a. Duplex telephone circuit (four-wire).

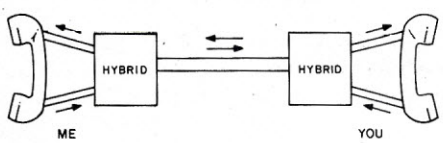

Fig. 7b. Duplex telephone circuit (two-wire).

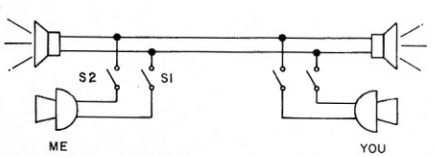

Fig. 8. Half-duplex telephone circuit.

(from page 47)

ever, there's a hidden cost—the modem, which can run as high as $500.

There are about 45 cities that have a Micronet telephone number (Table 1). In those cities you dial a local number and log in on Micronet. There are another 150-plus cities (Table 2) which connect to Micronet through Tymshare, a separate communications network, at an additional $2 per hour surcharge (total cost is $7 per hour). If you are not in a telephone exchange listed in either table, you must pay toll charges and/or pray the service expands to your city. Since the primary function of the network is to serve the commercial customers of Compu-Serve, the parent company, expansion may depend more on big-time

(continued on page 54)

Albany, NY	Huntsville, AL	Phoenix, AZ
Albuquerque, NM	Iowa City, IA	Piscataway, NJ
Alhambra, CA	Jackson, MI	Plymouth, MI
Allentown, PA	Jackson, MS	Portland, OR
Ann Arbor, MI	Jacksonville, FL	Princeton, NJ
Antioch, CA	Kalamazoo, MI	Providence, RI
Appleton, WI	Kansas City, MO	Reno, NV
Austin, TX	Knoxville, TN	Richland, WA
Baltimore, MD	Lafayette, LA	Richmond, VA
Baton Rouge, LA	Lansing, MI	Riverside, CA
Baytown, TX	Las Vegas, NV	Rochester, NY
Beaumont, TX	Lexington, KY	Rockford, IL
Birmingham, AL	Little Rock, AR	Sacramento, CA
Boise, ID	Long Island, NY	St. Joseph, MI
Bridgeport, CT	Longview, TX	St. Petersburg, FL
Bridgeton, MO	Los Angeles, CA	Salt Lake City, UT
Buffalo, NY	Lubbock, TX	San Antonio, TX
Cedar Rapids, IA	Lyndhurst,NJ	San Clemente, CA
Charleston, WV	Madison, WI	San Diego, CA
Charlotte, NC	Manchester, NH	San Jose/Cupert, CA
Chattanooga, TN	Manistee, MI	San Pedro, CA
Colorado Spgs., CO	Marina Del Rey, CA	Santa Barbara, CA
Columbia, MO	Marion, IN	Santa Rosa, CA
Columbia, SC	Merrillville, IN	Savannah, GA
Corning, NY	Miami, FL	Seattle, WA
Corpus Christi, TX	Midland, TX	Shawnee Mission, KS
Danbury, CT	Milwaukee, WS	South Bend, IN
Darien, CT	Minneapolis, MN	Southfield, MI
Daytona Beach, FL	Modesto, CA	Spokane, WA
Des Moines, IA	Morristown, NJ	Springfield, IL
Durham, NC	Mountain View, CA	Springfield, MA
Eau Claire, WI	Nashua, NH	Syracuse, NY
El Paso, TX	Nashville, TN	Toledo, OH
El Segundo, CA	Newark, NJ	Topeka, KS
Englewood Clfs., NJ	New Haven, CT	Traverse City, MI
Enumclaw, WA	New Orleans, LA	Tulsa, OK
Erie, PA	Newport Beach, CA	Valley Forge, PA
Evansville, IN	New York, NY	Van Nuys, CA
Ft. Lauderdale, FL	Niagara Falls, NY	Ventura/Oxnard, CA
Ft. Wayne, IN	Norfolk, VA	Vista, CA
Ft. Worth, TX	Oakland, CA	Washington, DC
Freeport, IL	Odessa, TX	Waterbury, CT
Fresno, CA	Oklahoma City, OK	Wayne, NJ
Grand Rapids, MI	Omaha, NE	W. Palm Beach, FL
Greensboro, NC	Orlando, FL	White Plains, NY
Greenville, SC	Oshkosh, WI	Wichita, KS
Harrisburg, PA	Palo Alto, CA	Wilmington, DE
Hartford, CT	Pascagoula, MS	Winston-Salem, NC
Hayward, CA	Pensacola, FL	Worcester, MA
Hempstead LI, NY	Peoria, IL	York, PA

Table 2. Cities that can access Micronet through Tymshare for a $2 per hour surcharge.

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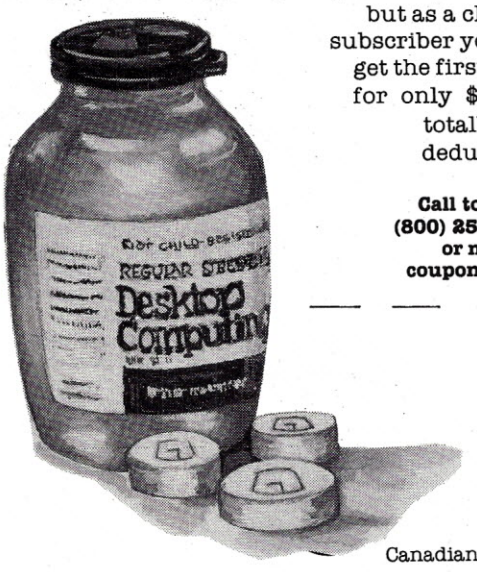

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Pin no.	Circuit name	Signal description	Type	Source
1	AA	Protective ground	Ground	—
2	BA	Transmitted data	Data	Terminal
3	BB	Received data	Data	Modem
4	CA	Request to send	Control	Terminal
5	CB	Clear to send	Control	Modem
6	CC	Data set ready	Control	Modem
7	AB	Signal ground	Ground	—
8	CF	Rec'd line signal detect	Control	Modem
9	—	(Reserved for testing)		
10	—	(Reserved for testing)		
11		(unused)		
12	SCF	Secondary carrier on	Control	Modem
13	SCB	Sec. clear to send	Control	Modem
14	SBA	Sec. transmitted data	Data	Terminal
15	DB	Trans. signal timing	Clock	Modem
16	SBB	Sec. received data	Data	Modem
17	CC	Receiver signal timing	Clock	Modem
18		(unused)		
19	SCA	Sec. request to send	Control	Terminal
20	CD	Data terminal ready	Control	Terminal
21	CG	Sig. quality detector	Control	Modem
22	CE	Ring Indicator	Control	Modem
23	CH/CI	Data rate select	Control	CH:Terminal CI:Modem
24	DA	Trans. signal timing	Clock	Terminal
25		(unused)		

Table 1. RS-232C connector pin assignments.

flexible, since in any application you are expected to provide and accept only the signals that application requires. We won't go into the complete standard here, but only those aspects which are of interest to the typical user operating at 300 bps. Furthermore, we will oversimplify some of the points for the sake of brevity. (If you really want to know *all* the details, you can always buy a copy of the standard.)

Briefly, a negative voltage is represented by 1 and a positive voltage is represented by 0.

The positive voltage put out by transmitters is expected to range from +15 to +25 V, depending on the load, and the negative voltage is expected to range similarly from −15 to −25 V. Receivers, however, are supposed to work on as little as ±3 V. These voltages allow a 12 V margin for voltage drops along the transmission line and a 6 V no-man's-land between 0 and 1 for immunity to noise and differences in ground potential.

RS-232C interface connectors usually have 25 pins assigned as shown in Table 2. Most of these are irrelevant to us, I'm happy to say. For ex-

Transmitted data is defined as data going from your terminal to the modem.

ample, my own modem uses only seven pins on its RS-232C connector.

We will discuss two ground lines, two data lines and eight control lines. The standard identifies every signal by a pair of letters. The names of grounds begin with the letter A, the names of data lines begin with the letter B and those of control lines begin with the letter C. For completeness, these names are given in Table 2, and I will also key my explanations to these names.

AA, protective ground, is just what its name implies. It is good practice (and in some places required by electrical codes) to connect the cases of electrical equipment to ground in order to minimize shock hazard; the protective ground is provided for this purpose. It also helps protect the equipment from possible damage from electrostatic buildups, in dry weather, for example.

AB, the signal ground, is the actual return used by all the pulses and signals in data transmission. It is hopefully assumed that AB is a little more free of noise than AA, although noise and potential differences on signal grounds are not unknown. (That's why we have a ±3 V noise-immunity margin.

There is a line for transmitted data (BA) and one for received data (BB), but you have to be careful here. RS-232C considers two general classes of devices: data terminal equipment and data communication equipment. The modem, or whatever is at the other end of the cable, is data communication equipment, even if it's your home computer. Transmitted data is defined as data going from your terminal to the modem, and received data is data going from the modem to your terminal, as illustrated in Fig. 9.

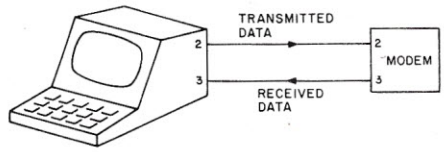

Fig. 9. Definition of transmitted and received data.

If two terminals are connected together by modems, then each terminal is a transmitter, as shown in Fig. 10. Part of the modem's job is to make sure that the transmitted data from my terminal becomes the re-

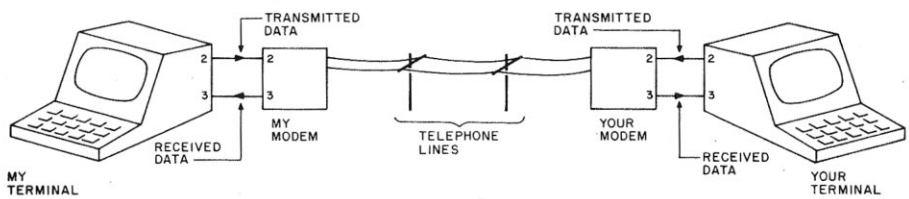

Fig. 10. Two terminals connected by modems.

↙See List of Advertisers on page 242

ceived data for your terminal, and vice versa. All the user has to do is be sure the terminal and modem conform to the RS-232C standard, and everything should work as expected.

Control Signals

The main purpose of the control-signal lines is to make sure device A doesn't transmit data when device B isn't listening. Thus, most of the control signals indicate the status of some device or other.

To transmit data between your terminal and some remote device, at least three conditions are necessary: your terminal must be ready, the modem must be ready and the data link (phone line) must be ready. It's not surprising that the three basic control signals indicate these three conditions.

Data-terminal-ready (CD) is a control signal sent from your terminal to the modem indicating that the terminal is ready. In most video display and printing terminals, I find (to my surprise) that this line goes on when you turn the terminal on and stays on regardless of any local error conditions or whether the terminal is set to LINE or LOCAL.

Data-set-ready (CC) is a control signal sent from the modem to your terminal indicating that the modem is prepared to handle signal data.

In the simple acoustical couplers I will describe below, data-set-ready goes on when you turn the power on.

Clear-to-send (CB) is a control signal sent from the modem to your terminal indicating that the phone line is ready to transmit data.

Carrier on (CF) is officially named received line signal detector. This line is turned on by the modem when it detects some kind of signal from the data link that it can understand. Usually this will be the carrier used for sending data to the modem, so the Bell System (and I) prefers to call it carrier on.

Now, before we continue, let's think about these signals for a minute. If you have ever hooked into a timesharing service, you have probably never given them a thought. You dial the number; when you hear the answering squeal from the other end, you shove the handset into the coupler and start to log on. Why all these signals, then? Well, they are there for the controller.

In the situation I've just outlined, you are the controller. Your ear serves as the received line signal detector; you know that the terminal is ready because you just turned it on; and if the modem isn't ready, you'll soon find out when you try to log on. But in more ambitious systems this whole business may be handled by some microprocessor-based controller, either in a local computer hooked into the modem or inside the modem itself. In that case, the controller has to know what's going on, and that's what these signals are for.

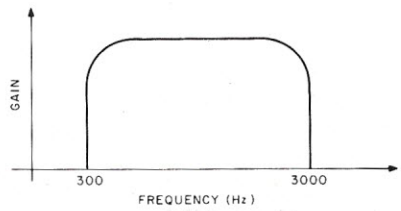

Fig. 11. Typical frequency response of voice-grade phone line.

Another signal which you don't need, but an intelligent modem does, is the ring indicator (CE). This is exactly what you would think it is: when the phone rings, this signal goes on. As an example of its use, go back to what happens when you dial up a data network. You dial the number, the phone rings, and the network answers it. In the network's modem is a circuit which detects the presence of a ringing signal. It responds by turning the ring indicator on, and the modem answers the phone. (The modem probably also turns clear-to-send on and notifies the network that you are there.)

Those are the most important control signals. (Some high-speed data links use half-duplex lines. You will recall that a half-duplex line can transmit data in either direction, but

(from page 50)

commercial customers than microcomputer users.

Getting Started

When you log on to Micronet you first get the Compu-Serve information network. This is an almost bewildering array of menus asking what information you would like—news, weather, sports, financial, entertainment, etc. The selected option prints out the information on your computer. At this time, much of the news and sports comes from the *Columbus Dispatch* newspaper, although majors from across the country are coming on-line next year. It's fascinating to watch the daily news run across the screen, but at eight cents per minute it might be more cost effective to have the local newspaper delivered. Nevertheless, computer communication is probably the wave of the future. Micronet's offerings continue to grow each week. Unfortunately, they preface many of the menus and pages with disclaimers and mini-ads which eat up time.

Micronet proper is among the information service offerings. When you select Micronet you get a welcome message and a suggestion not to go further without a Micronet guide (which is furnished in the sign-up package). Now you can use the bulletin board, send messages to other users, order printed material (your printouts or their manuals) and use a corner of Compu-Serve's big DEC (Digital Equipment Corporation) computers as if they were your own. But don't expect to run a really large program with lots of lines or big arrays. You only get 16K DEC words (72K bytes) of core, or CPU, memory. I found I could dimension a variable in their BASIC to 10,000, but not 15,000.

Micronet Offerings

A variety of games, utilities and languages is available on Micronet, including FORTRAN, Pascal and, of course, BASIC. There are some cross-assemblers available for the 8080 and 6800 CPUs. With the basic information package you get their reference book for extended BASIC, which seems to be a very powerful compiler. I ran one of the timing loops that appeared in *Microcomputing* in November 1977, and had to increase the loop index by 10 in order to get anything long enough to time.

When I tried running a FORTRAN program I got a bunch of system error messages indicating I did something wrong, but since I had no FORTRAN reference manual I couldn't fix the problem. If you want to use other languages you have to buy Micronet's reference manuals at up to $12 each.

not in both directions at once. With those systems, if you have been receiving and want to send, you have to get the data link to turn the line around for you. What happens is that some controller in your system sends a request-to-send to the modem. The modem turns itself around and also tells the data link to turn the line around. When this has all been done, the modem turns clear-to-send on, and this tells your controller that it can go ahead. Most connections of importance to use are full duplex, however, and that is why request-to-send is of only academic interest.)

Modems

We saw before that serial binary data as defined by the RS-232C standard consists of a series of voltage pulses like the ones shown in Figs. 3 and 4. There are a number of reasons why you can't just send a pulse train down an ordinary telephone line as-is. First, there are problems when you run RS-232C signals over wires longer than 50 feet. Also, in the frequency response of a voice-grade telephone line (shown in Fig. 11), the telephone passes frequencies between roughly 300 and 3000 cycles per second (Hz). The relatively long idle states that can occur between characters, and which I have shown in Fig. 4, are essentially dc levels, and the phone system doesn't transmit dc.

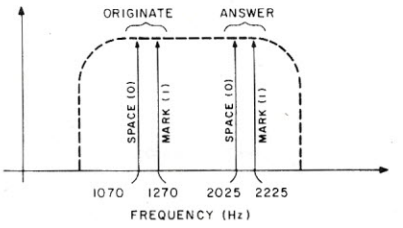

Fig. 12. Frequency assignments for low-speed full-duplex modems.

The rising and falling edges of these pulses, on the other hand, require good high-frequency response to preserve their sharpness, as anyone who has ever tested an audio amplifier with square waves can tell you. The consequence is that if you were to put the pulses directly into your end of the line, you would get mush out at the other end. (The same problem occurs when you try to record digital data on a voice-grade cassette tape recorder.)

For these reasons, we carry the data on pure tones (sine waves) whose frequencies fall inside the telephone system's frequency response. Imposing information of any sort on a sine wave is called modulation, and the converse process of extracting the information from a modulated sine wave is called demodulation. What we require, then, is a modulator/demodulator, called a modem for short.

The modem designer has three basic tools to work with: frequency modulation, amplitude modulation and phase modulation.

We need a system that will give us full-duplex capability. Therefore, we need two channels, one for data going from your terminal to the service you're using and the other going from the service back to your system. Since you are the one who places the initial call, yours is called the originating modem and the service's is called the answering modem.

Each channel is actually a pair of frequencies, one for binary 1 and the other for 0. These four frequency assignments are shown in Fig. 12.

These signals can be passed between you and the phone system in two ways. First, you can simply wire the modem into the phone system (most modems provide a two-wire connector for the purpose); second, you can build a little microphone and loudspeaker into the modem so it can talk and listen to the phone system by way of your telephone's handset. This second and most common type of modem is called an "acoustical coupler." A typical acoustical coupler is shown in Photo 1. The rubber cups are used to exclude outside sounds and are made to fit a standard Bell System 500-type telephone set. (If you bought one of those stylish designer type phones, you may have problems.)

Even so, Micronet is a good opportunity for you to try languages other than BASIC without spending hundreds of dollars for your own microcomputer version.

There is no extra charge for CPU time. You get 128K of on-line file storage to save programs and data. You have to access the file at least once a month or it will be purged from their system. As part of Micronet you have access to a good file editing utility, which is explained in detail in the user's guide. It may not be screen editing like some of the fancy word processors, but it is very good and easy to use.

If you want hard copy, you can receive a file printed at CompuServe's computer center in Columbus, OH. The cost is about ten cents per page of line printer output ($3.50 minimum) and is billed to your charge card.

Micronet features an assortment of canned programs and games. Many, like Lunar Lander, are stock microcomputer games, and it's probably cheaper to buy a home version from Instant Software. But then there's "Adventure," the all-time classic game which eats up so much memory that it's only available in disk versions for micros with lots of memory. If you've never played it, try it on Micronet. Of course, it also eats up time, which you are paying for!

There are a host of other available canned programs which are more practical, such as the financial programs which compute interest, etc. Those are nice because you usually need them infrequently and may not find it worth the effort to program them on your own system.

There are two more features of Micronet. One is MicroQuote, a stock market service package, which costs an additional $1 to access and assumes a certain amount of financial savvy.

The other feature is the executive downloader which allows you to download programs and data from Micronet to your micro. For $9 Micronet will send you a disk with the program on it; TRS-80 users get something similar in the $30 Videotex package (which includes the $9 sign-up fee), available from Radio Shack.

Some multiuser computer systems get bogged down when many users are online, but Micronet shows little sign of delaying its response when a command is entered. In other words, you feel that you are the only user and the computer is waiting for you. The quick response is partly due to the fact that some of the housekeeping and input/output communication is handled by peripheral computers and because a user is limited in the size of a program that can be run.■

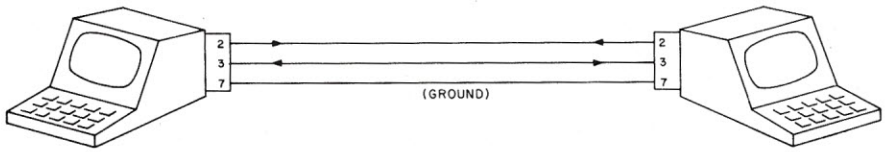

Fig. 13a. Two terminals connected by an RS-232C cable.

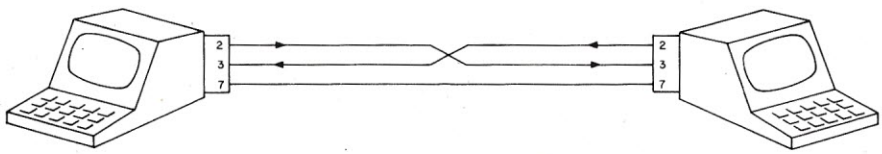

Fig. 13b. Two terminals connected by a null modem.

To see how these four frequencies are used, let's review what happens when you call up a data service. You dial their number; their modem answers the phone and transmits a 2225 Hz (binary 1) signal. Your modem hears this signal, turns on its carrier-generator inside your modem warbles between 1270 and 1070 Hz to encode the 1s and 0s. The warbling corresponds exactly to those asynchronous bit patterns we talked about before. (This warbling is technically known as frequency-shift keying [FSK].) Whenever the service answers back, its tone warbles between 2225 and 2025 Hz. Full-duplex operation follows as a matter of course.

People don't often connect terminals together
this way (with a null modem),
but there are occasionally connections
to other equipment that act the same way.

on control line, and responds with its own 1270 Hz signal. (If you are using an acoustical coupler, you may hear these tones briefly as you insert the handset.)

Whenever you send data the signal

You will occasionally hear mention of a thing called a null modem. This is nothing more than a slightly modified RS-232C connecting cable, used to solve a peculiar connection problem. To see what this problem is, suppose you wanted to connect two terminals together. An ordinary RS-232C cable between the two would look as shown in Fig. 13a. This won't work. Why? Well, look at pins 2 and 3. Transmitted data from my terminal isn't going to your receiver, but to your transmitter.

The solution is simple: switch the connections between pins 2 and 3, as shown in Fig. 13b. Now transmitted data from one terminal becomes your received data for the other, and vice versa. A null modem is simply an RS-232C cable with its wires crossed. People don't often connect terminals together this way, but there are occasionally connections to other equipment that act the same way, and null modems are provided for such applications. (This is the exception to my previous statement that things conforming to RS-232 will always work together.)

More About Half Duplex

Some data systems will specify that you must operate in half-duplex mode, and most terminals have a switch somewhere that lets you select half- or full-duplex operation. Now the funny thing is this: even under these conditions, you and the service will still use the four-frequency, full-duplex scheme that I've just outlined. What's going on?

To answer this look at what happens when you type something at your terminal. You hit the keys, and letters appear on your display. Where did they come from? If you are running full duplex, they came from the other end of the line. Your equipment transmits the typed characters to the remote system. The remote system receives them and echoes each one back to you. This provides a degree of insurance: you see not what you typed but what the remote system thinks you typed.

In some systems, however, the characters are not echoed. (In big data networks, this may be because there really is a half-duplex link somewhere along the way, even though your local link is full duplex.) In that case, you will never see what you typed—only the replies sent back to you. So most terminals provide a switch labeled something like half/full duplex, and if you set this switch

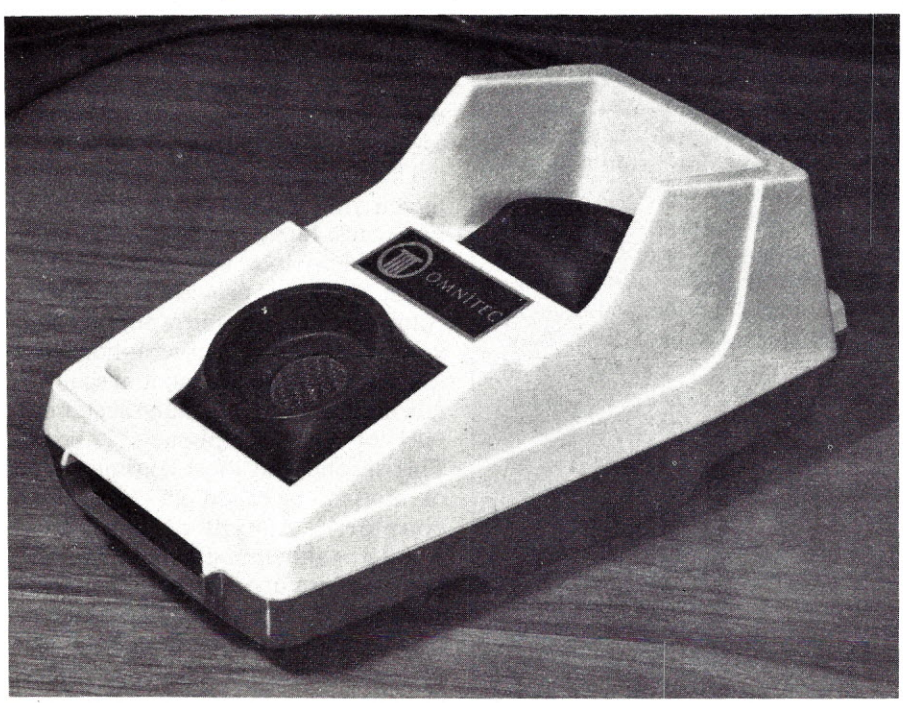

Photo 1. Omnitec acoustical coupler. Note rubber cups for telephone handset and RS-232 connector.

to half, it makes a local connection between the keyboard and the display so you can see what you typed. This is called half duplex, but all it amounts to is that one local connection. There is no monkey business with request-to-send, no turning the line around.

The main reason to know this is so you can understand one of the ways a timesharing system can act up on you. I got a panic call one evening from a friend who said his terminal was stuttering. Sure enough: when he typed "HELP," the terminal wrote: HHEELLPP.

The problem was simply that his terminal was set to half duplex when the system expected full duplex. The first H came from his keyboard; the second was echoed an instant later from his timesharing service. A flick of the half/full duplex switch solved the problem.

Conclusion

I wish I could guarantee that you would solve all your problems as easily as we did that one. Nevertheless, I believe this article will give you the basics you need to benefit from more advanced articles and books on data communications. I have only touched the surface; if you wish to dig deeper, I have listed some good places to look in the references. The Institute of Electrical and Electronics Engineers (IEEE) Proceedings issue is getting old, but it's an unparalleled summary, provided you don't get snowed or put to sleep by it. Both DEC books are highly readable, and I have a special fondness for Murphy and Kallis since that was my own first introduction to data communications. ■

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See List of Advertisers on page 242

Bibliophiles and computerphiles agree that computer communications has increased the efficiency and resource-sharing abilities of libraries. Witness the OCLC (Online Computer Library Center) System with its over 2400 member libraries.

Quiet—Computers in The Library

By Judith M. Jenkins

If your impression of a library is musty tomes and dusty shelves; if you envision a bifocaled librarian perched on a stool surrounded by volumes of uncataloged material; it's time to renew your library card. Today's library, particularly at the college and university level, is likely to be automated and efficient. Catalogers sit in front of computer terminals, where bibliographic and holding information for millions of documents is instantly available.

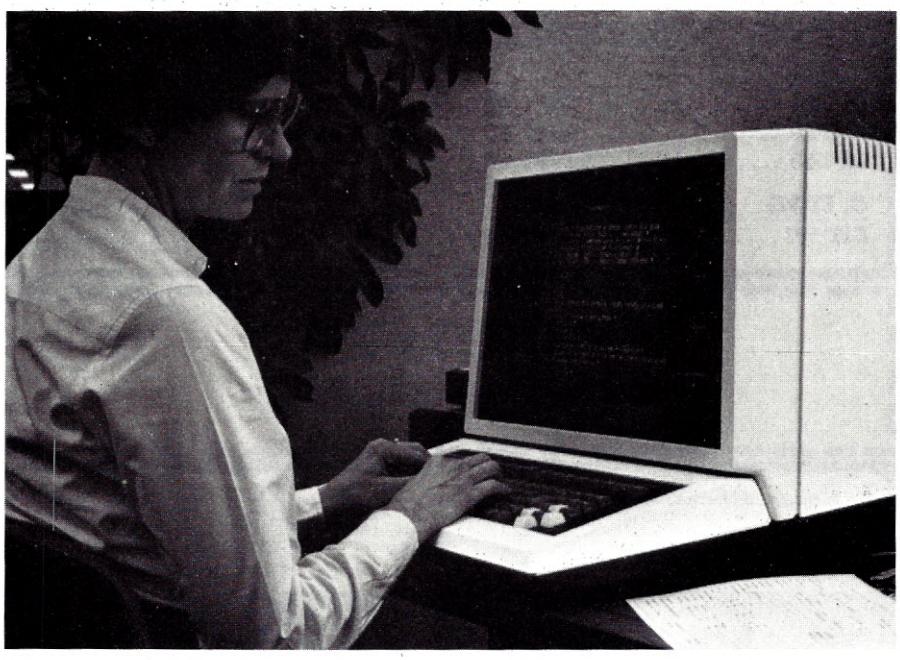
One organization that has contributed to this dramatic turnaround in library operations is the OCLC Online Computer Library Center of Dublin, OH. OCLC operates a bibliographic computer and telecommunications system to support resource sharing among libraries. Member libraries use the OCLC Online System to catalog books, serials and various other library materials; to order custom-printed catalog cards; to maintain location information on library materials; and to conduct interlibrary lending. The system provides information to member libraries through remote terminals linked to OCLC's computers by dedicated, leased communications lines or through dial-access terminals.

OCLC was developed in 1967 by the Ohio College Association as a cooperative, computerized regional network for 54 Ohio member college libraries. In fact, up until 1977, "Ohio College Library Center" was the name behind the OCLC acronym. Almost from the start, OCLC met with unexpected success, and has been growing ever since.

"We came around at a time when funds for libraries were decreasing, particularly in the 1970s," says Frederick G. Kilgour, OCLC's founder and former president. "Society had decided it wasn't going to support them like it had in the 50s and 60s. Libraries looked around for ways of cutting costs and there we were."

Today the not-for-profit OCLC system serves over 2400 member libraries in the U.S., Canada and other foreign countries, and has recently opened a European office in Birmingham, England. A staff of two in 1967 has mushroomed to over 435, most of whom are headquartered at OCLC's spacious new corporate office and computer center. Assets have jumped from $62,000 in 1967 to a startling $57.9 million, as of last fiscal year.

To what does OCLC owe this steady record of growth and acceptance? One answer lies in the advances in computer technology that have kept computer costs constant and affordable to libraries, thus expanding OCLC's pool of potential clients. But the real reason is the cost-saving services available to libraries through the use of the system. Library costs generally have increased at a rate higher than inflation, so the resource-sharing and cost-paring features of the OCLC system are attrac-



User at OCLC terminal (Ramtek terminal, OCLC Model 110) has more than 7.2 million bibliographic records at her fingertips.

Judith M. Jenkins (2342 Neil Ave., Columbus, OH 43202) has a master's degree in educational communications. She has worked as a librarian, editor and information specialist, and is currently a free-lance writer.

tive to those struggling with dwindling library operating budgets.

Online System Design

OCLC's services are offered through a computer network of several subsystems. The Cataloging Subsystem is the most heavily used, and for good reason. Prior to the introduction of the OCLC Online System, most libraries manually prepared cataloging information for every piece of library material. (The cataloging process includes classifying a document by subject, assigning an appropriate call number and preparing bibliographic information that is put on catalog cards for library files.) The cost of cataloging a book sometimes exceeded its purchase price. And patrons had to wait months for new material to become available because of cataloging delays. Moreover, this same cataloging process was repeated in every library that acquired a copy of the same item.

With the OCLC Cataloging Subsystem, a user can retrieve all the necessary information to catalog an item by typing a simple search command at a terminal keyboard. As the desired records are displayed on the terminal screen, they may be used as they appear, or edited to conform to an individual library's cataloging practices (without altering the database). Libraries can add to the database by typing the necessary information on a blank work form displayed on the terminal screen.

OCLC's database, the Online Union Catalog, contains more than 7.2 million bibliographic records for books, serials, audiovisual materials, maps, manuscripts, scores, sound recordings and other library materials. The database is growing at a rate of about 25,000 records per week; 21,000 of these are provided by OCLC member libraries. Other records come from the Library of Congress and National Library of Medicine, which are batchloaded into the system weekly.

When a library catalogs its library materials through the Cataloging Subsystem, the system automatically adds to the record that library's unique three-character location symbol assigned by OCLC. Thus, any other library using the OCLC system can retrieve bibliographic information on a given item and can also tell which libraries have cataloged it and included it among their collections.

According to Philip Schieber, OCLC's public relations manager, through the Online System user libraries are able to locate an estimated 94 percent of the items they are processing. This means that only about 6 percent of their new material must be manually cataloged, a substantial savings in time and library costs.

A step related to the cataloging process is card production, another useful capacity of the OCLC system. By hitting the produce key of the terminal, users can order customized catalog cards for any item on the system. OCLC produces more than 2.5 million cards per week on request, using more than eight tons of paper. Card production and shipping is handled at the main OCLC facility. The cards are received by the requesting library in filing order, ready for insertion within the card catalog.

Only about 6 percent of their new material must be manually cataloged, a substantial savings in time and library costs.

Another popular feature of the OCLC Online System is the Interlibrary Loan Subsystem. This subsystem allows libraries to draw upon the collections of other libraries to fill patron requests. Member libraries can initiate, send and fill loan requests solely through online interlibrary communications. Potential lending libraries are identified by the location symbols that are displayed in the Online Union Catalog along with bibliographic records.

An average of 17,973 interlibrary loan requests are entered in the Interlibrary Loan Subsystem weekly. Ninety-seven percent of these requests can be filled by member libraries.

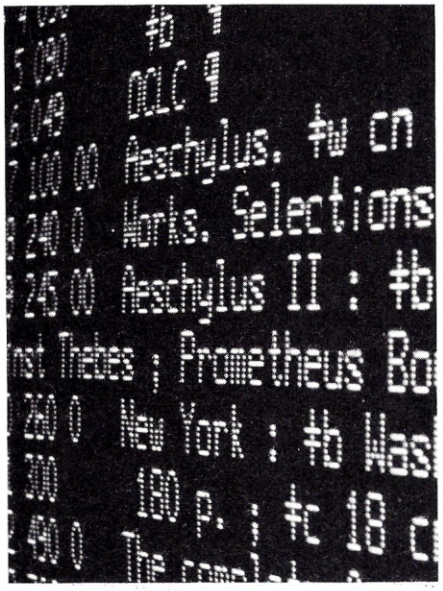
For magazines, journals and other serialed items received by libraries, the Serials Control Subsystem provides online access to up-to-date, detailed holding information on serials cataloged through the Cataloging Subsystem. The system can predict the next expected issue number and date of receipt of a serial and can identify missing issues, thus streamlining the frustrating process of serials control.

For ordering, receiving and claiming library materials, there is the Ac-

At James Madison University, Harrisonburg, VA, the OCLC system is the answer to easing the ever increasing workload in this rapidly growing library.

quisitions Subsystem. With information for an item entered in the Online Union Catalog at the time it is ordered, library staff can promptly catalog and process a new item when it is received.

A new subsystem for circulation control is now under development. It will eliminate manual preparation of circulation forms and provide automatic check-outs, check-ins, renewals, holds and queries for library materials.



Close-up screen display of a bibliographic record search.

Users

Who are the users that derive so much benefit from these OCLC services? Certainly, library patrons are affected by the system through their library's increased efficiency and resource-sharing abilities, but the ordinary library patron may not be aware that OCLC exists. The users are typically the professional staffs of the over 2400 member libraries. Sixty percent of these members are college and university libraries, which account for more than 65 percent of all cataloging done today in the U.S. The nonacademic segment is largely made up of public, government and private or special libraries. Membership in OCLC continues to grow at a rate of about 20 to 30 libraries per month.

For membership and other support services, OCLC also relies on regional networks, or independent local organizations that contract with OCLC to provide OCLC services to their member libraries. Training and technical assistance to users frequently is handled through these network offices.

Accessing the System

Most users are linked to OCLC through specially designed OCLC terminals and dedicated, leased telephone lines. Some have dial-access terminals. Others have no terminals of their own but share with neighboring libraries. Today, over 4060 remote terminals are linked to the OCLC system, with 50 terminals added each month. Terminals now cost members $3700 (other costs to members include annual membership fees, monthly telecommunications and maintenance charges and access charges for various uses of the system).

About the Equipment

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D116 minicomputers serve as line concentrators to over 180 2400-baud full-duplex multidrop lines. The D116s are connected to an expandable Tandem system with eight processors acting as a network supervisor (NS). The Digital Computer Controls and Tandem computers are the communications portion of the Online System. (OCLC has also implemented two Tandem communication processors as a first step toward replacing the D116s. Each of these communication processors is a two-processor system, one located at OCLC and one located in Atlanta, Georgia.)

For applications processing, the NS communicates with six Xerox Sigma 9 computers through a custom interface device. The Sigmas are linked to an expandable (currently 16 processors) Tandem system acting as a database processor through the same kind of interface device used for linkage to the NS.

OCLC maintains two administrative/development computers, a Sigma 9 and a Tandem. Two more Sigma 9 computers are used full time to produce subscription service tapes, catalog cards and accessions lists. These are supplemented by the development computers and the online mainframes during the Online System's nonoperational hours.

In addition, OCLC uses an IBM 4331 computer with seven 3302 line printers, two tape drives and two 65-megabyte disk drives to print cards and other products. Also in use is a Xerox 9700 laser printing system.

Is it any wonder that computer rooms are spread over 43,000 square feet and three levels of the new office building?

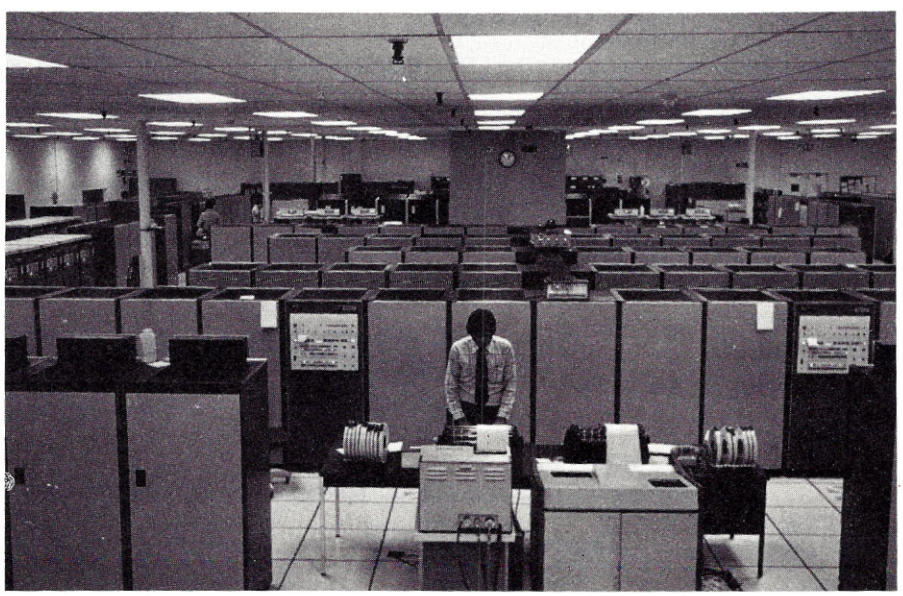
It is also interesting to note that these computers help earn their keep —the free heat they generate is harnessed and routed into the building's heating system.

What Lies Ahead?

The new corporate home of OCLC offers some telling clues to the direction the company is taking. It is an open-space plan, progressive, even bold in design, with flexibility a key design concept. It exudes a definite "corporate" image for OCLC, one that shows growth is expected and planned for. Flexibility is built in to accommodate a changing organizational structure and technological advances. Obviously, the growing pains that afflicted this small company ten years ago will not happen again.

Although academic library membership in OCLC is showing signs of leveling off in this country, there are new markets to be tapped, and OCLC is already exploring them. For example, there is great potential for expansion in foreign countries; hence the OCLC/Europe office. OCLC also is alert to possible new uses of its database. School library systems (below the university level), which currently account for less than 1 percent of OCLC users, have yet to be serviced. These and other independent, local libraries may be able to tap into parts of the OCLC system that best fit their needs.

An active component of the OCLC structure is its Research Department,



Computer room at former OCLC facility, to be moved over six-month period to new Dublin site.

whose mission is to conduct research "in all aspects of library and information science supporting both OCLC requirements and the broader needs of the library and information science community."

One recent project that generated considerable media attention involved testing a viewdata system called Channel 2000 in 200 Columbus, OH, homes last year. Channel 2000, an in-home information service, turned a TV set and telephone into a computer terminal. From their living room armchairs, residents could select and check out books from the local library, conduct personal banking operations, refer to an encyclopedia or consult a calendar of community events. Basic math and reading drills were available for children.

According to Tom Harnish, OCLC Research Scientist who directed the Channel 2000 project, "The findings are encouraging enough for us to continue to explore this new medium through Viewtel, a new in-home and in-office information project under way at OCLC. Channel 2000 has shown us that we're on the right track. There are in-home information services in the future for libraries."

Does this mean that libraries as we know them will become obsolete? Will our system of collecting and storing printed materials give way to all-electronic libraries?

This isn't likely, at least in the near future. Books still adequately serve the collection function of libraries, storing long-term the records of mankind. And should the technology become available for the electronic transformation of our libraries, it would probably be cost-prohibitive for most libraries, especially those supported by tax dollars.

Technology does have its place in the library, though. Computers are an ideal means for storing and retrieving fast-changing reference information. And, as is evident through the success of OCLC, computers can streamline tedious and expensive library procedures and expand library capabilities through computerized resource sharing. Channel 2000 has shown that computers can feasibly bring portions of libraries into the home, reaching a clientele that possibly would never set foot in a library building.

In its final report on Channel 2000, OCLC offered some provocative comments regarding libraries and new technologies:

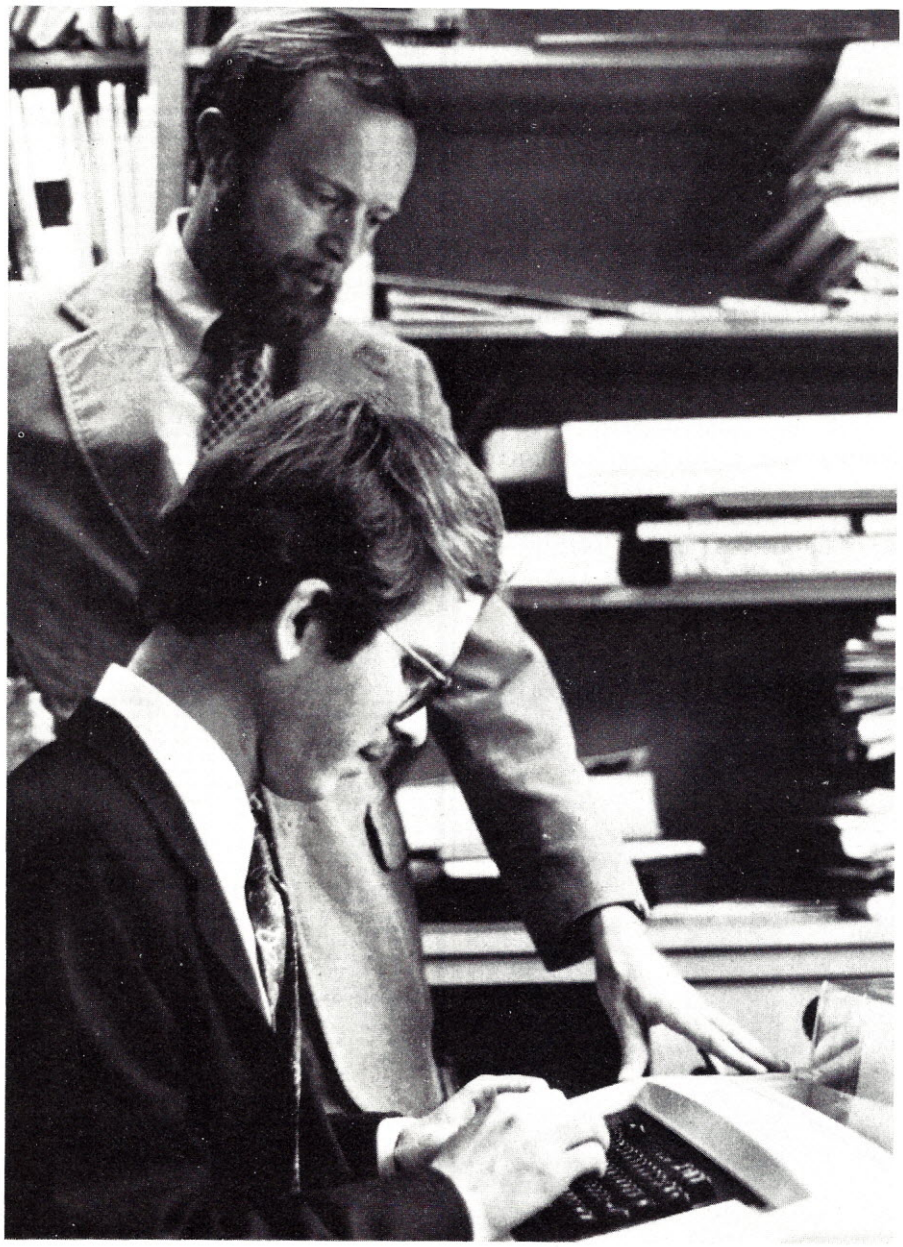
> "Libraries now stand on the threshold of great opportunities. Emerging electronic technologies provide the potential for a new age of community service in which the library can command new attention and financial support as an information resource. . . As its patrons accelerate into the future, libraries must as well. The alternative is irrelevance. And irrelevant institutions disappear."

With its computerized resource sharing system and exploration of new applications of computer technology, OCLC is doing its part to keep libraries relevant institutions, abreast of the relentless consumer demand for information.■

OCLC Corporate Office and Computer Center, Dublin, OH.

Patrons at the West Hartford Public Library may soon be cashing in their library cards for light pens if the success of the Searchline computer project is any indication.

Searchline



Library director Denis M. Lorenz (standing) and Searchline research analyst Daniel Weinstein.

By Rick Hartford

Tucked away in a cluttered closet-sized room at the West Hartford, CT, Public Library is a computer terminal that has given the library the research prowess of a major think tank.

Librarians call the service it provides Searchline.

Searchline, a Digital computer terminal hooked into a General Data Com modem, stretches out through the telephone lines into the brains of more than 200 databases in various parts of the country. Sitting just a few yards away from a stack of old encyclopedias, the terminal has quietly turned the library into a place where patrons have access to more than 50 million documents in science, technology, business and economics, the social sciences and the humanities.

Other innovations during the past year have also helped to supercharge the library, which serves a population of about 61,000 in this bedroom community of Hartford.

For instance, employees, working on a couple of video display terminals, are plugging W. Hartford into the Online Computer Library Center (OCLC) network. This lets librarians get their fingers into a national catalog pool with holdings of more than five million publications.

And the library has joined with the CirCess network (computer circulation system of the Capital Region Library Council), which in effect expands the local collection to include

Rick Hartford is a reporter for the New Britain, CT, daily, The Herald.

12 other library systems in New England.

That's a jump in the number of books to which they have access of nearly one million.

All in all, the library now has the most comprehensive search capacity in Greater Hartford, and that includes major universities, some corporations and other public library systems. "It has made us a major research institution, as opposed to a public library," says Searchline research analyst Daniel Weinstein.

And he adds, "We don't even know ourselves what we have access to."

West Hartford Public Library.

Searchline

The library's Searchline service includes Dialog from the Lockheed Missiles and Space Company, the New York Times Information Bank, the Dow Jones Information Service and, just recently, System Development Corporation's Orbit.

Most of the databases are indexes of books, periodicals and reports. But abstracts of articles, or, in some cases, entire articles, can be printed out while the patron waits. Or photocopies of articles can be requested, sometimes arriving within 24 hours.

About half of Searchline's users are in business. Most of the others are college researchers, coming from the University of Connecticut, the University of Hartford and other institutions nearby. Patrons pay from $3 to as much as $200 for one search, with the average search costing about $15.

Business users don't usually worry about the price tag, and are billed for the service, Weinstein says. But for the general public, Searchline can be expensive, unless the research question is very specific.

But not always. One client wanted general, up-to-date information on the Liberian revolution, but didn't have a lot of money to spend.

"We got quite a few articles for his $7," Weinstein says, from the New York Times Information Bank. And they were articles that couldn't have been found in the paper Times index, which has a lag time of about five months.

One of the greatest assets to the intellectual and business community is the library's acquisition of statistical databases, where clients can get an immediate computer printout of up-to-date statistics on a variety of subjects, Weinstein says.

One question he recently processed was "What foreign countries are importing a particular U.S. product?" Received was a complete list of firms, with their names, addresses and the sales volumes of the product of interest, he says.

Another question he received was: "How many accounting firms in Hartford County are big enough to have more than 20 employees?"

One person wanted information on the ski equipment industry. The client wanted to know what the growth pattern would be of ski equipment sales in the United States, projected to 1985. "We went into a forecasting database," Weinstein says. By manipulating that, they were able to get statistics, including the percentage of sales volume, from 1975 to 1985. The sources of the information also were delivered with the statistics.

"These are the types of databases that are really being pushed today," he says—statistical rather than bibliographic.

Other research questions Weinstein has explored have included:

- Uses of and recycling methods for discarded tires.
- Tax deduction for the home office.
- Methods of disinfection by ultraviolet radiation and who has patented this process.
- Soil cementing agents.
- Underachiever programs in public high school.
- Municipal programs for prevention of vandalism.
- Aggressive behavior of automobile drivers.
- Stone wall construction in 18th and 19th century New England.
- Female sexual arousal.
- Temperature control and the work environment for minicomputers.
- The skill level for programmers in computer aided design (CAD).

Weinstein says that the library can request periodic updates on statistical information for the client.

And the beauty of researching through Searchline, he said, is that the computer hunts through all of the index references in a fraction of the time it would take to do it in printed indexes.

The library taps into the OCLC network through the New England Library Information Network (NELINET). The main service of the OCLC is to convert all of the library book cards into computer printouts to replace the old cards. It is a permanent record which can be added to, or changed, locally.

The added advantage of the system is the ability to locate any book in the system. This means the librarian here can tell what library owns a particular book. That book can be borrowed if it is available. The OCLC network is hooked into public libraries, college libraries and special libraries, says library director Denis M. Lorenz.

Expanded Capacity

In the last year, the introduction of its new services has increased the library's potential output capacity so quickly that its ability to deliver in-

formation has been outstripped. Luckily, demand has not caught up with supply.

An article in *Business Week* last March mentioned the Searchline service, and quoted Lorenz as saying that Searchline use would soon jump from two to three searches a day. It was a self-fulfilling prophesy—the article triggered a flurry of inquiries, from as far away as Wisconsin.

"With three searches daily," says Weinstein, "we're at a level we can support."

While Searchline pays for itself, greater demand would require another research analyst (there are now two —Weinstein and Gary Molyneaux). This is at a time when the library is under increasing pressure to reduce library staff, and the W. Hartford Town Council has told the library to cut $15,000 from the budget.

The library last year persuaded the town to let the library buy into the CirCess system. Lorenz told it that CirCess would let them keep personnel costs down.

But "we have expanded our workload, not decreased it," Lorenz says. The savings will only be realized in the long run, after the library converts by hand 250,000 book and 40,000 patron records to standardized computer cards.

The CirCess system, accessible through a central computer located at the Hartford Graduate Center, allows the library patrons in 13 towns in Greater Hartford to have access to all of the books.

Conclusions

"Use of the library's new database services can only increase," Weinstein says. With a shrinking school-age community receding from a high of 12,910 public school students in 1969 to a projected enrollment of 6178 in 1987, "we have the capacity for a much larger audience," he says.

Also, he points out that students in public schools are beginning to learn about computer use at the grade school level.

And what will library use be like in the future? Instead of library cards, says Lorenz, books will someday be taken out and returned with a light pen.■

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Industry leaders from around the world recently met in Toronto to discuss this question.

Can Videotext Work?

By Henry and Elizabeth Urrows

The long-talked-about surge in videotext is closer, if developments reported at the Videotex '81 conference in Toronto last May are any indication. After the current wave of trials in the U.S. and Canada, there may well be a new growth industry. [Editor's Note: Videotext is a generic term for two-way communications systems using the telephone network and television receivers for displays.]

"With many of the decisions, announcements, euphoria and some rhetoric that has gone on this week, we can now begin to focus more on markets, applications, systems and how these systems work together to serve the user of these mass-market systems," Haines B. Gaffner, founder-president of Link Resources, told the Home Information Systems panel on the concluding day.

But Gaffner also issued a caution: "Despite all these standards and technical talk there is still absolutely no proof that there is a demand for what we're all talking about."

Industry leaders from all over the world came to the three-day conference to discuss the current and future state of videotext, and to demonstrate their wares. The question: Where is the market for videotext, and how will the industry reach it?

To date, videotext databases have primarily been geared toward the businessman. But Gaffner pointed out that home and office markets are converging as the means for distribution of information, entertainment, advertising and messages become more portable.

"What's really important is what is the device and what is the information," he said. "It doesn't matter where the person using that information sits.

"Take the personal computers. A year and a half ago Apple and Tandy were not much seen in the office. Today they have the office automation companies on the run. Apple moved onto the desk of the office manager, while Wang sat outside the door with the secretary, and the device on the desk becomes a terminal able to tie into a variety of videotext systems.

"The Source and CompuServe have found that services created for the home are being used more and more in the office and by businessmen in the home, so The Source is now upgrading to make business sources available," Gaffner told the crowded hall.

He gave two recent large-scale purchases as examples.

"If there ever was a device created for the home, the French electronic directory terminal would be it. But GTE ordered 35,000 of them to go into the office to access telemail.

"And you can ask the Tymshare people what they're going to do with the 100,000 terminals they've ordered from Matra," he suggested. "I would imagine that many of them are going to go into the office in 1981-82."

Gaffner is certain that information retrieval applications are not "going to get these new systems off the ground." Bildschirmtext, the West German system now in its market trials, whose officers announced that they will start full public service in 1983, will provide capability for electronic mail and messages, electronic funds transfer and ordering of merchandise and services.

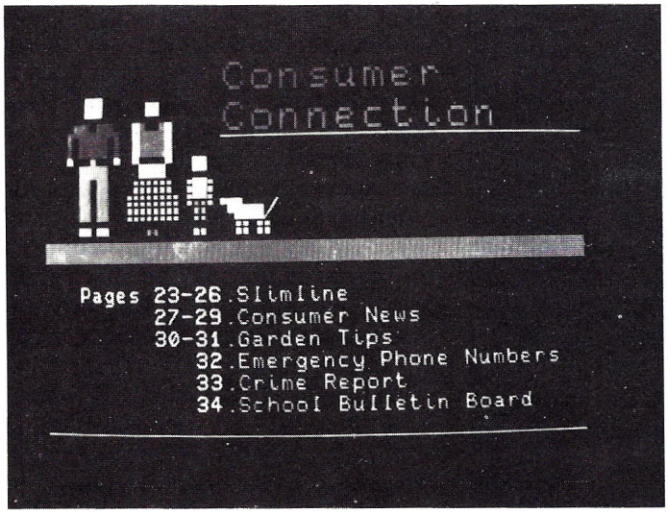
Coral Gables

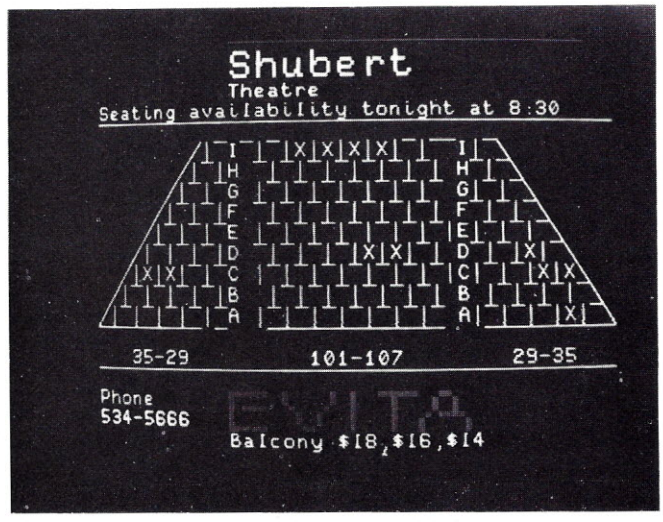
Albert J. Gillen is president of the Knight-Ridder subsidiary Viewtron Corporation of America, which has conducted a "concept trial" jointly with AT&T in Coral Gables, FL, since July 1980. He says that they have not proved that videotext *can't* work.

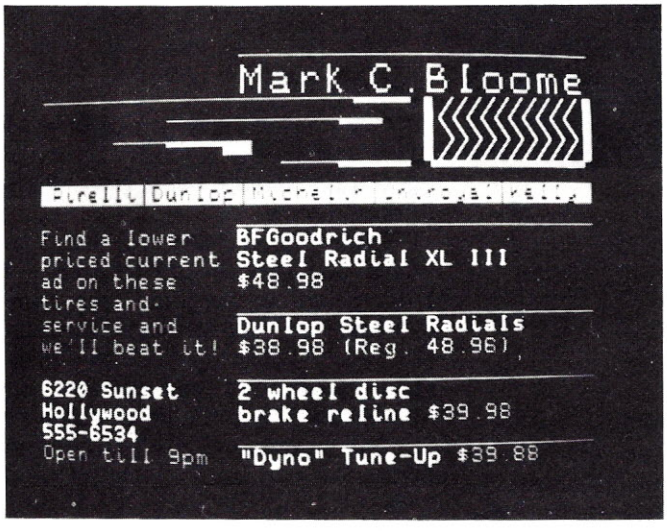
He showed slides illustrating pages that residents in about 200 homes can select to order items from Sears' and J.C. Penney's catalogs; learn their account balances at Southeast Bank; get reviews of books and order titles; order wines from Shell City Liquor; learn restaurants' specialties, prices and what credit cards they accept; play a golf game; do comparison shopping through Consumers Union pages to learn test results, flaws and relative prices of appliances; retrieve data on different auto models' stroke, displacement, accessories, mileage per gallon and prices; and get updated news bulletins, movie reviews and horoscopes.

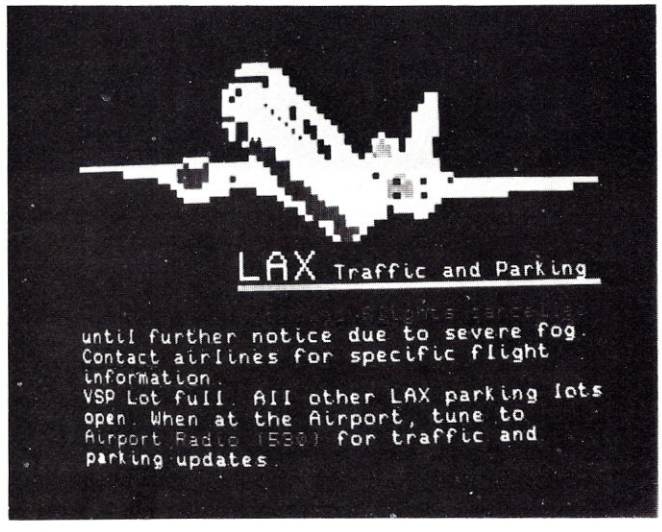
The Viewtron database has 18,000 pages in the system at any one time. Its operating staff of 30 has created and discarded between 300,000 and 400,000 pages since preparing for the trial. After seeing other systems, the Knight-Ridder people "knew it was possible to put the world at our fingertips," Gillen said, but they had to learn: "Do Americans want it? What will they do with it? And for how long?"

Address correspondence to Henry and Elizabeth Urrows, Box 332, Ridgefield, CT 06877.









Four Viewtron frames among the more than 300,000 made for the Knight-Ridder-AT&T trial in Coral Gables, FL. Theatre seating chart at upper right is updated with more Xs as tickets for those seats are sold. (Color shows badly on the LAX frame. The first line reads incoming and outbound flights cancelled.) LAX facts on availability of parking space can be changed as quickly as the facts do.

The only way they could measure user attitudes, they decided, was to build a prototype and put it into real homes. All this required was time, people and a lot of money.

Even with AT&T providing the terminals, and accepting on faith Viewtron's guess that in production these would cost between $400 and $700, Gillen says he has no idea what a commercially operating viewdata system might charge its end users.

They learned that this service can have a potentially unfavorable impact on newspapers and radio stations. One slide, for example, showed an auction page, exemplifying classified advertising through which a householder can offer a bicycle or used refrigerator for sale. Obviously, videotext represents competition to other media.

Gillen gave a striking example of potential cost savings to a large business information provider. When Eastern Air Lines customers finally manage to get through the busy phone lines and reach a passenger agent, they often ask not only for the flight time, fare, and space availability, but if a particular flight serves a meal, what kind of plane it is, the climate and weather at the destination, and how many carry-on parcels are permitted. These questions cost a substantial amount of money to answer. EAL estimates that if it can cut the length of an average call by 30 to 45 seconds, the resulting savings will total $1 million.

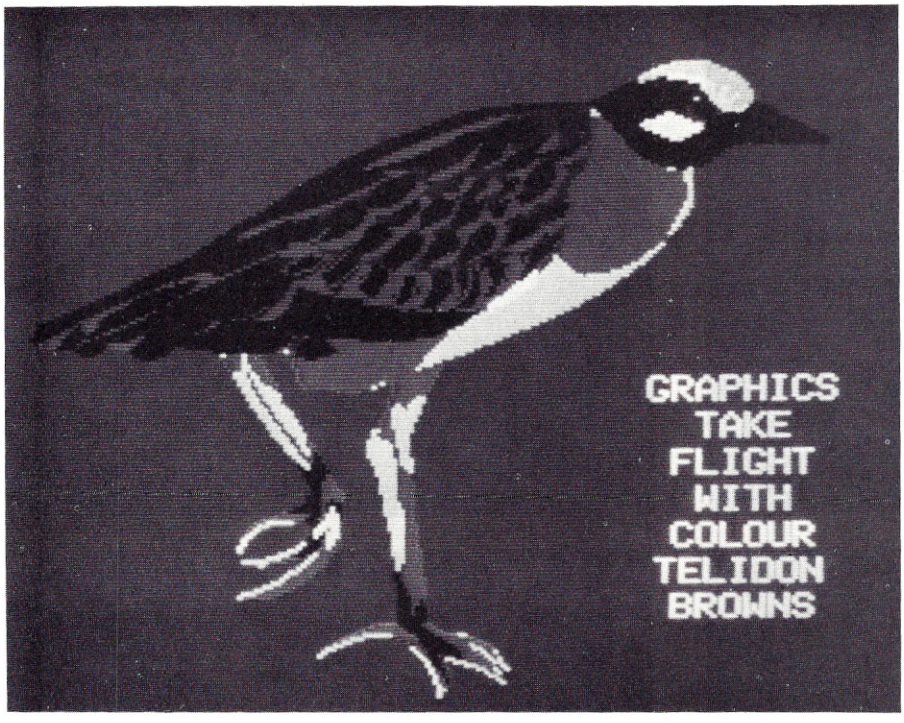
That would be good for EAL. For the consumer, the lowered costs might mean fares won't escalate quite so fast.

Gillen told how one visitor at the Viewtron exhibit was amazed that at 12:11 PM, by simply pressing a button, he was able to get the noon stock prices. That broke any spell Viewtron may have woven: any microcomputer owner hooked up to Dow Jones through The Source can get this service now, without waiting for Knight-Ridder, AT&T or anyone else to make a corporate decision about videotext.

News

General manager of the *Columbus Dispatch* Robert M. Johnson told of an experiment, begun July 1, 1980, in conjunction with AP and CompuServe, on electronic delivery of its newspaper database to home video terminals. He stressed that, unlike Viewtron, this was not a controlled experiment. It neither placed nor subsidized terminals, but charged $5 per hour to persons who had bought their own equipment.

The *Dispatch* found that its database had more use outside of central Ohio than in it, where getting the data electronically cost more than buying a paper. Local readers pay more for less when they access by



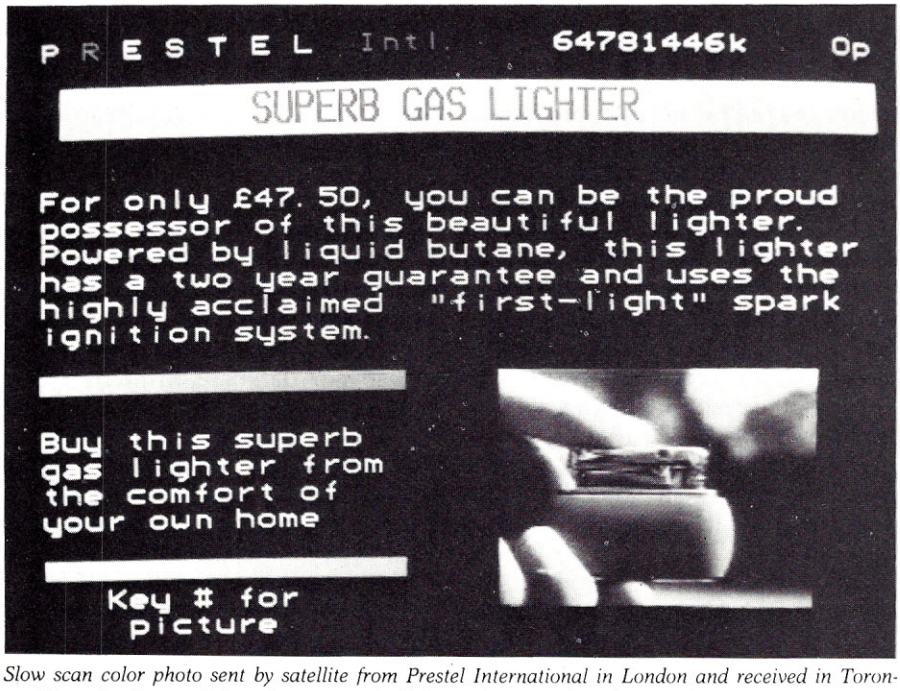
Canada's Telidon videotext system uses alphageometric coding, with PDIs (picture description instructions) directing uses of such primitive components as point, line, arc, rectangle and polygon along with their relative locations, sizes and colors. The new AT&T presentation level protocol provides four forms for each primitive; eight control codes [Reset, Domain, Text, Texture, Set Color, Control status (Wait), Select Color and Blink] plus 64 character positions for numeric data corresponding to a six-bit data field in each information byte.

computer. But early evidence shows substantial interest outside the normal circulation area.

The newspaper will now "always include a substantial portion of its daily content in the database because it costs us next to nothing," Johnson said. "However, within central Ohio we must provide value-added services by taking advantage of the new medium."

He sees designating stories that should be kept updated, keeping late-breaking stories and sports constantly retrievable, and expanding on advertising with more on-line detail than appears in print as the next logical steps. However, it is difficult to justify the expense of doing these things for only 400 or even 4000 users.

Viewtron's trial in Coral Gables is an expensive way to find that videotext is a possible rival for both the time people spend reading a newspaper and for a paper's classified advertising income. The *Columbus Dispatch*-AP-CompuServe experiment deals with here-and-now accessibility to a newspaper's expanded databases via microcomputers, without waiting for public dissemination of commercial videotext.



Slow scan color photo sent by satellite from Prestel International in London and received in Toronto. The signal containing the text arrived instantly, but the photograph required nearly two seconds to build.

Added Value

Frank L. Greenagel, president of Arete Publishing Co. in Princeton, NJ, put teletext-viewdata advantages in these terms:

"I think there are three ways in which videotext can add value for the business and professional user: One, the *rapidity* with which new information can be made available and fully integrated into an existing corpus of information; two, the *enlargement* of the total corpus of information, and three, the *accessibility* of that total corpus."

In each case, Greenagel said, videotext can not only do these things better than print, but can do them in a more cost-effective manner. Note that his comparison is not with microcomputer reception but with printed subscription reference books.

His own company's new general encyclopedia, the *Academic American*, went on-line for the Channel 2000 viewdata test conducted by the On-line Computer Library Center (OCLC) in Columbus, OH, during the last three months of 1980. Two-hundred homes had access through a 32,000-term thesaurus and 200,000-keyword index to the 32,000-entry, nine-million-word text. The New York Times Information Service has contracted to make this database available to its subscribers for printouts. Greenagel says that the same material will be available via an information utility to microcomputer users.

Arete's *Academic American* is being updated monthly in as much detail or depth as its editors think appropriate, without the worry of fitting an item into available space between two

other articles. Thus the database becomes very dynamic.

"Right now there's a lot of interest in El Salvador," he said. "There's a need for something more than 5000 words on El Salvador. As long as you've got an interactive database you can let it go to 15,000 words and in a couple years, if the situation passes, let it shrink.

"From a user's perspective, no longer will he have to shuttle back and forth between volume and supplement, yearbook, revised edition and indexes that don't cumulate. No longer will the user have to wait until the next edition comes out. Information is available now."

Expanding on his second added value, Greenagel said that videotext enables the information provider to significantly enlarge the total body of information that can be made available to the user. As the cost of paper, printing and binding escalates and the cost of storage and manipulation of digitally encoded data drops, more information can be made available at a lower cost.

"Some scientific journals now experience a three- to four-year delay between an article's acceptance for publication and its appearance on the newstands. This has nothing to do with the editorial process, as I thought when I was in that publish-or-perish kind of situation. It deals entirely with the cost of the available space. When space is limited, the articles simply have to queue up until space becomes available. This will not be the case when such journals are available in some kind of videotext or online fashion."

On the third added value, Greenagel stressed the totality of a body of information becoming more widely accessible.

"The domain of science has been fragmented into ever-increasing specializations. One of the most remarkable tendencies of 20th century science is the unification of many disciplines around a fairly small number of themes and principles or lines of inquiry," he reasons. This tendency has great importance for the accessibility of information.

"The biochemist must keep up with what's happening not only in his own field," Greenagel suggests, "but in those related fields that have great implications."

We might remember that Mendel's laws of genetics went unread for longer than a generation because the

Videotext and Society

One of the last scheduled panels at Videotex 81 was Videotex in the Service of Society.

Peter G. Bowers, managing director of educational telecommunications for TV Ontario, reported on two years' tests of Telidon's possible educational applications. Since January 1980, TV Ontario has broadcast a sample teletext magazine 16 hours a day, eight hours during the summer. It augmented conventional transmission by sending broadcast and piggybacked teletext signals to 46 earth stations in northwest Ontario via satellite.

Dr. Maria L. Cioni, in a paper titled "Telidon/Satellite Delivery: An Alternative for Opportunities in Education," writes that traditional educational institutions, whether in cities or rural areas, have trouble adapting to students' needs. Course material provided electronically would permit more individualization and negate restrictions of time and place. TVO, she says, "considers it feasible that, outside broadcast hours, it could deliver in Telidon form course materials to students in isolated areas. If teleconferencing facilities were available the class could 'meet' or a student using his Telidon terminal could directly contact his tutor's terminal for supervision. The tutor would be able to adjust the course or send materials immediately via Telidon to help the student."

Dr. Cioni wrote how adult education academies, such as one on parenting in which over 2000 people enrolled, could be more responsive by using Telidon to supplement the visual information and provide instant feedback.

Because of increased demand for vocational training, she foresees supplementary instructional material being sent by teletext to satellite receivers at mining camps in remote parts of the province, where it could be videotaped and used as needed.

Bowers mentioned the PBS station WETA trial that began in May in Washington, DC, using Telidon decoders "to evaluate user need and access to public information." CBC plans to begin a field trial in Montreal, Ottawa and Toronto in September, and CTV (Canada's private TV network) is considering teletext as an administrative tool to transmit information between network and affiliate stations at a projected $250,000 annual savings.

Jeffrey L. Campbell, Bell Canada's

Phone line	Cable TV	FM Subcarrier	Broadcast TV
Viewtron	Belo/Sammons	Datacast	KSL-TV
AT&T/EIS	Cox		CBS
Green Thumb	QUBE		WETA-TV
CompuServe	Cabletext		Closed Captioning
OCLC	Times Mirror		
The Source			

Table 1a. Mode of delivery or communications network.

12 × 16	32 ×20	40 ×20	60 ×24
CompuServe	KSL-TV	Belo/Sammons	The Source
Green Thumb		AT&T/EIS	
OCLC			
Cox			
QUBE			

Table 1b. Display formats: number of rows times characters per row.

Continued on page 72.

Continued from page 71.

assistant director of environmental research, and Socioscope, Inc., president Michael B. Gurstein told of heavy planning for social uses of videotext in Canada. A government Task Force on Services to the Public plans a trial involving up to 100,000 pages aimed at promoting access by the public to government services and information, with 90 terminals across Canada in post offices, shopping centers and government agencies. The Community Information Centre of Metro Toronto has proposed that it serve as an information broker or umbrella information provider for voluntary and nonprofit groups, using money Bell Canada will supply as part of its forthcoming Vista trial in Toronto, Quebec City and Montreal.

Brian G. Champness of the Plymouth Polytechnic psychology faculty in Britain, and head of the Applied Behavior Research consultant firm, reported on social uses of videotext in the U.K., starting out with praise for Bell Canada's giving 10 percent of its Toronto field trial terminals to voluntary groups, in contrast with Prestel giving up financial support for sponsoring social uses.

He said that "a careful survey of user reactions among a sample of the 120,000 teletext users" in Britain found they "come from the professional and skilled occupational classes, are generally more prosperous than the population at large, and are generally heavier users of information of all sorts, including libraries." As to why they bought the sets, "many simply wanted a new TV, and the salesman said that teletext was the latest thing to have. Having invested in it, however, users seemed to be well satisfied."

Two teletext experiments for instruction involved a telesoftware trial in which schools with computer terminals supplied by the government Department of Industry off-loaded computer programs broadcast over Oracle and CEEFAX, a project now being evaluated by Brighton Polytechnic. In 1979 CEEFAX and Oracle's 19 Schools Project sent out special pages to back up such TV programs as "Exploring Science" before and after they were aired, supplying notes for teachers and reminders to students. Later repeated for six junior schools, Champness' verdict is, "The experiments appeared to be successful, if unremarkable, one of the benefits being increased classroom discussion."

	Info Rtrvl.	Games/ Enter.	Trans-actions	Elect. Mail	Data Proc.	Home Mgmt.
Viewtron	X	X	X	—	—	—
OCLC	X	X	—	—	—	—
QUBE	—	X	X	X	X	—
The Source	X	X	—	X	X	X
CompuServe	X	X	—	X	X	X
AT&T/EIS	X	—	X	—	X	—
Belo/Sammons	X	—	—	—	—	—
KSL-TV	X	X	—	—	—	—
CBS	X	X	—	—	—	—
Closed Captioning	X	—	—	—	—	—
Green Thumb	X	—	—	—	—	—
Prof. Farmers	X	—	—	—	—	—
Comp-U-Star	—	—	X	—	—	—
Dow Jones	X	—	—	—	—	X
Datacast	X	—	—	—	—	—
Cabletext	X	—	—	—	—	—
Cox	X	—	—	—	—	—
WETA-TV	X	—	—	—	—	—
Times-Mirror	—	X	X	—	—	—
Assoc. Press	X	—	—	—	—	—
HomServ	X	—	X	—	—	—
Prestel Int'l.	X	—	—	X	—	—

Table 2. Existing and proposed applications.

Continued on page 74.

journal in which his work was published was not widely read. Also for several years astronomers and cosmologists were unaware of the Williams and Penzias evidence supporting the big bang theory of the origin of the universe for which they subsequently were awarded the Nobel Prize, even though it had been published.

Advice for Information Providers

Greenagel was pointing to markets larger than those microcomputers are likely to reach as long as they require computer language competence. He outlined the attributes that a successful videotext publisher will need. Expectations of the audience for videotext, videodisk or smart terminal online search are very different from those of people content with the traditional print publications.

Paul D. Doebler put it very well in a recent issue of the *Book Industry Study Guide* when he wrote that "while many books can achieve acceptable sales by providing some information of use and appeal. . . the essential idea of a database is for it to be one place where all the relevant information about a field is organized for easy access and retrieval for all possible uses. This implies more thorough coverage of a field than all but the most encyclopedic books. The editorial implication is one of properly covering a field or universe, not simply packaging enough information to make a book."

The publisher must move from simply evaluating the quality of a manuscript into long-range planning that defines a total publishing program, if he expects any part of it to go into an interactive database.

If we are to move from business and professional users to households, there will need to be audio. Home viewers are conditioned to look at images on the tube accompanied by some kind of noise. One OCLC finding was that many people experienced sensory deprivation when they spent more than a few minutes interacting with a silent television set.

"They started talking to themselves, I understand," Greenagel added, but "perhaps that was because of the kind of data on the TV tube."

Those who intend to reach any part of the great consumer audience have a great deal to learn because "this is a very different breed of cat. School is only the second curriculum. The first

Everybody's making money selling microcomputers. Somebody's going to make money servicing them.

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Growing Demand for Computer Technicians

This is only one of the growth factors influencing the increasing opportunities for qualified computer technicians. The U.S. Department of Labor projects over a 100% increase in job openings for the decade through 1985. Most of them *new* jobs created by the expanding world of the computer.

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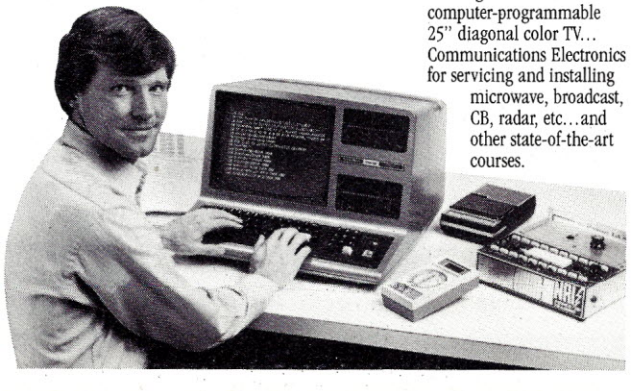

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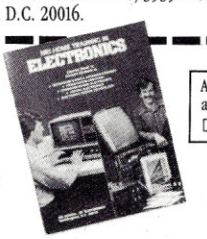

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- ☐ Small Engine Servicing
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City/State/Zip

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See List of Advertisers on page 242

Continued from page 72.

He was somewhat less grudging in relating some of the increased educational uses for Prestel in education. The national Council for Educational Technology coordinates a trial "covering a broad range of educational and training interests," with terminals and adapters furnished by the Department of Industry. The Council serves as an umbrella IP, and is experimenting with Prestel as an aid to processing University applications.

The Hatfield Polytechnic Unit for Computer Based Education has put 12 CAL packages on Prestel. This unit is cited as saying that "many of the 2000 secondary schools which have microcomputers" will be "able to pull down whole trees of information off Prestel, and interrogate them off line" in what it says will be "a very short time."

When we were in England last fall, 112 subscribers to Prestel were educational organizations or institutions. At least 40 IPs had educational axes to grind.

A number of government departments use Prestel pages on consumer rights, how to make planning applications, current food prices and what their specific subsections do. Libraries have participated in an experiment guided by ASLIB (Association of Special Libraries and Information Bureaux) that gives information in social issues, welfare, employment, leisure interests and where to find counseling for specific needs.

Local governments—Hatfield and Hertfordshire among them—have formed consortia of small district councils, become corporate IPs, rented out pages to local businesses, and derived enough income to pay for their own messages on "what time the swimming pool opens" and "where to take your rubbish on a Sunday."

Telemachus, in conjunction with the Biological Engineering Society and the Disability Alliance, has a database of 350 pages on services offered, benefits and new kinds of equipment for physically handicapped people.

CEEFAX and Oracle have substantial numbers of deaf and hard-of-hearing users among those who own and have access to 120,000 teletext sets. Three important organizations for the deaf report very favorable feedback, in addition to the subtitles on regular TV programs CEEFAX was first designed to strengthen.

The positive response to these pages is echoed in Sweden, which has used the British teletext system since mid-1978. Of the 30,000 Swedish teletext viewers at the end of 1980, about 20 percent were deaf or hard-of-hearing. Nearly all viewers relished the teletext subtitles enabling them to follow dialog of films in non-Scandinavian languages.

Home TV Set	Computer Terminal or Home Computer	Additional TV Set or Monitor
Viewtron (phase 2)	The Source	AT&T/EIS (Albany)
Cox	CompuServe	Viewtron (phase 1)
Belo/Sammons		
Green Thumb		
KSL-TV		
QUBE		
OCLC		
AT&T/EIS (Austin)		

Table 3. Display device.

Numeric keypad	Alphanumeric Keyboard	Both Keypad and Keyboard
Cox	The Source	AT&T/EIS (Austin)
Belo/Sammons	CompuServe	Viewtron
KSL-TV	Datacast	
QUBE	AT&T (Albany)	
Green Thumb		
CBS		
WETA-TV		
OCLC*		

*Table 4. Input device. (*More extensive than a standard keypad but not a full keyboard.)*

U.S. Videotext—Trials And More Trials

Under a National Science Foundation grant, John Tydeman and Lawrence Zwimpfer surveyed probes of consumer market applications in the U.S., examining 22 current and proposed uses. While these are small in scope compared with national networks proposed elsewhere, the number of users exceeds those in most other countries. In January 1981 there were 40,000 teletext users here; 32,000 had decoders for captioning services for the deaf, and over 14,000 were interactive videotext users. Tydeman and Zwimpfer neatly arranged services and trials from five standpoints (see tables).

In their technology assessment project, the authors conducted a number of futures workshops. Public policy concerns and possible social impacts that kept recurring were market organization and industry regulations; economic dislocation and job substitution; centralization of information and control and ownership; content and control; standards; legal liability and integrity; consumer protection; equity of access; privacy and security; and personal tastes and religious beliefs.

They listed the following questions:

- How will increased access to information affect consumers?
- Should access be guaranteed for minority groups?
- Who is responsible for the reliability of the information?
- Are there safeguards over user profiles and use of statistics?
- Is there a need for censorship of some materials?
- How can access to the systems be restricted to specific individuals?

Also, who ensures that participants receive their rightful winnings in electronic gambling systems? What protection/penalty is available for the impulse buyer, the no-show ticket reserver or the person who constantly returns products, when you consider that electronic records of past behavior may be readily available? Is the carrier required to provide a means of preventing objectionable material from entering the electronic mailbox?

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Does the electronic downloading of software and data violate copyright statutes; who enforces these laws and how? What fail-safe mechanisms are there for energy management systems and burglar and fire alarms?

The Institute for the Future study report said that key societal themes developed from these and related questions can be expressed as a series of contrasts. The new services can allow many citizens to choose their geographic locations, yet decrease social and community interaction. Decision-making can be promoted, with local councils and state authorities requesting or compelling residents to comment or even vote on some issues; but injudicious use of such a system can foster hasty and perhaps ill-reasoned decisions based on short-term popularity.

There can be unlimited consumer choice of electronic Babel. There may now be information overload, too much variety, with information having little substance and no style: "There are staccato assessments of complex issues, even more simplified than TV news reports." Under equity and access, there can be a trend toward more equalized information, or the poor may get poorer as the cost of information services and the sophistication needed to use them increase. As Tydeman and Zwimpfer put it, "Manual, visual and cognitive skills needed to operate even electronic keyboards and a charge-per-access time militate against the slow, the uneducated and in general the poor."

The contrasts under socioeconomic organization are stark. On one hand, "Consumer sovereignty is a reality . . . once your feet have been measured and the information recorded, purchasing shoes electronically is a matter of selecting design and quality, subject to cost."

And yet there is prospect of "a very small number of organizations . . . providing goods and services for this market, and the whole principle of antitrust reemerges. The benefits of vertical integration lead to a one-company monopoly . . . the production, distribution and warehousing support to this 'non-middleman' society is now designed with a new set of critical paths and nodes . . . centralized state warehouses

Continued on page 76.

Continued from page 75.

with personalized delivery to individuals within communities increase their susceptibility to industrial or management blackmail."

Under financial structure the contrast is "cashless society or Big Brother... The encrypted 'smart' card, coupled with public videotext and even mobile machines in cars, offers the consumer the chance to undertake most transactions electronically, irrespective of location." But every "transaction is recorded in individual files. The underground economy—babysitters, garage sales, private car sales—is now the province of the Internal Revenue Service. A single identification card with suitable security together with a centralized file on every individual provides the groundwork...for Orwell's 1984 scenario."

The single meeting open to the general public was on social impacts of videotext. The privacy theme kept arising. S. Philip Gardiner, a canny Scot from the Gamma Research Group, said enough information sources are already available to intrude upon personal autonomy, which he defined as the capacity to represent yourself in public as you wish. He likes in principle the vision of the future advanced by David Godfrey of the University of Victoria, a situation in which all information can be available to all people in all places at all times, with one qualification: that "if the information is about me, there is some information available to some people in some places, sometimes," which can be released only "at *my* discretion."

Godfrey and E.J. Chang of the University of Victoria department of computer science offered "some benchmarks" for a Canadian information policy. Along with many other proposals, they asked for "standards of privacy much higher than we have now.... The true individual [not a large corporation, whom they regard as a pseudo-individual] should have full rights to all information that concerns and creates his or her sense of identity. There must not be restrictions on use of such identity-information. Those who store information should be required to report such information and its uses on at least an annual basis." ■ *H. and E. Urrows*

curriculum in terms of time, money and attention is television...These people are not book buyers or heavy readers. What they will be willing to read on a television screen, and in what manner and for how long will be shaped by what they have been watching on television...No matter how highly motivated the user, he or she will become tired after reading relatively few screens of printed text."

His conclusion for designers of electronic publications: "We've got to be comprehensive, and curt. It cannot simply be print on a screen. The home consumer wants information in a fashion not dissimilar from what he is seeing on TV. The professional user is going to need to see more than the crude illustrations currently possible with the videotext technology. That's why I believe very strongly in the videodisk interface. Material is going to have to be instantly retrievable and quickly assimilated."

In Greenagel's view, the belief that everything in print has a market in an electronic format is simply nonsense, "and yet there is a whole bunch of publishers down in New York who thinks that is true." We do our customers and ourselves a disservice if

we treat videotext simply as an alternative form of delivery. "It's not. It cannot be. It's got to have value beyond what exists in print." Even current best-sellers may be regarded as primitive once more imaginatively practical packaging and graphics are infused.

It is still not economical in most cases, he is certain, to create new databases just for electronic dissemination.

"Print publishers are going to have to piggyback their materials on channels developed and paid for by the entertainment industry, advertisers, and shortly the large, integrated financial service institutions which establish their own networks."

Greenagel mentioned an experiment employing videodisks as a storage medium for data to be sent to special professional and business audiences. He was surprised at how low the cost promises to be. He thinks that special-interest monthly publishing may be possible with videodisks. But others questioned the acceptance of videodisks by the consuming public and the need for the mass-storage capacity of disks.

Reaching for More

Ted Nelson, director of Project Xanadu (an effort to create "a universal publishing system for linked text, graphics and other information") and former editor of *Creative Computing*, said that "Unfortunately people seem to be wondering what videotext *is*, rather than wondering what it *should* be."

Asking what the public wants is futile, because the public does not even know what is possible. This lack of awareness is "to an extent, shared with both the video community and much of the computer community."

At Project Xanadu he and his colleagues "are building (to please ourselves) a public-access storage and publishing system—intended finally as a videotext service—based essentially on a 'literary' model. . . Documents of any size may be published; they may cite and quote each other; and readers may create private notes on them and links to them, just as one may write in the margin of a book."

The trademarked Xanadu hypertext system supplies an instantaneous-access repository for text and graphics that one, provides any part of any document on demand; two, has no arbitrary boundaries; three, does not encumber users with complex serial numbers or codes; four, can grow indefinitely without slowing down markedly its response time; five, allows any user to create marginal notes or footnotes to anything (and stores them privately); and six, allows users to publish their own anthologies or collages of material already in the system—while seven, assuring royalty payments to copyright owners whenever anything is so used

Setting the Standards For the Industry

The big news at Videotex 81 was the first public disclosure of AT&T's Presentation Level Protocol (PLP) videotext standard.

"We felt the market was ready to go, but were afraid of non-compatible systems exemplified by incompatible video cassettes, disks and other media," said Joe Wetherington of Bell Telephone's consumer systems advance planning and development group in early June.

Wetherington said that just as the ASCII seven-bit code for alphanumeric characters was a considerable improvement over the five-bit Baudot code, AT&T felt it had to do better than accept the three incompatible graphic and control codes developed by Prestel, Antiope and Telidon.

"We came up with 100 percent of their functionality," Wetherington asserted, "then improved on what they had." But it may not be that simple. Those three systems have demonstrated alphagraphic coding to send photos over telephone lines, a feature that AT&T does not take into account.

Standards for broadcast videotext must be approved by the Federal Communications Commission, whose decision is unlikely to appear for a year, but videotext sent by cable or phone needs only commercial approval. And, as the *Wall Street Journal* observed on the day AT&T announced the protocol, "with its market dominance AT&T is likely to set technical standards that could shape the capabilities of videotext for the next 20 years."

Meanwhile, reactions from those responsible for existing systems, the press and AT&T's own personnel varied greatly. Reactions of spokesmen from Canada's Department of Communications (which has invested heavily in Telidon) and CBS (user of the French Antiope system) were that they would change their decoding terminals to conform to the new PLP.

Only five days earlier the 26-nation CEPT (Conference of European postal and telephone authorities) had confirmed its videotext standard, incorporating features of the British Prestel, the French Teletel and the West German Bildschirmtext—all based on alphamosaic coding. The Japanese Captain system, now in the second phase of its trial in Tokyo, uses the alphaphotographic coding that AT&T's PLP simply ignores.

PLP merits notwithstanding, these countries—with a lot more videotext experience than America—say they will do all they can to bring about an international standard.

CompuServe's Richard Baker said its program will be geared to whatever standard emerges. CompuServe regards the industry, he said, as "hardware-driven" and is sure that information providers will mold graphics and text to what is available.

A summary of some of the features of AT&T's PLP was given by Joe Wetherington in Toronto.

- Text can be created with ASCII alphanumerics, special character sets, and with the Dynamically Redefinable Character Set (DRCS) offering custom fonts. Also, text can be rotated to appear at different angles on the terminal. The DRCS allows for the design of up to 96 custom pel (picture elements of pixels) patterns that can be downloaded from the host computer to

Continued on page 78.

by other publishers.

Nelson also raised several questions:

- Why should a videotext service be limited to one type of computer or terminal?
- Why not let users define their own screen performance and interaction behaviors?
- Why not let users be providers?
- In other words, why not have it all?

Where Does Videotext Fit?

The answer to Nelson's question—why not have it all?—was tacit and nearly unanimous among the delegates whose primary concern was finding in the "new" medium a way to make a buck. Nelson's voraciously ambitious imagination identified his interest with those of the end user.

Bill Shrimpton of Logica, who headed the British Telecom team that developed Prestel International, had shown a chart at the Viewdata 80 conference in London (see Fig. 1). It staked out the terrain where viewdata can render a service more satisfactorily and economically than other forms of communication.

You can name your own favorite examples to put in Shrimpton's large circle. Lockheed Dialog's SCI-

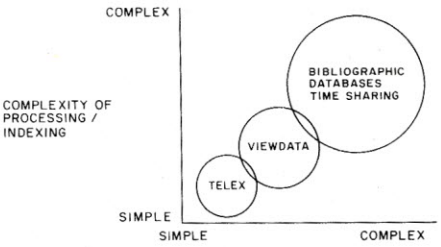

Fig. 1. Complexity and detail of data.

SEARCH has about two million items from 1974 through 1977, and has been adding approximately 48,000 items a month to a comparable file from about 4000 scientific and technical journals. In this regard, Videotext complements other information resources.

Others besides Nelson objected to strict pagination. Greenagel's *Academic American* takes as long as it needs to render an article.

Still, Ted Nelson injected gracenotes that those who are so anxious to engender sales income from subscribers ought not to ignore. So fearful are some of them of making recommendations that might lose money, that they are wearing blinders, confining their intentions for videotext to the widest popular markets while ignoring the individual customer.■

Continued from page 77.

the terminal and used as any ASCII or graphics character sets.

- Six geometric graphics primitives (point, line, arc, rectangle, polygon and an increment primitive with four operation codes to display sequences of points, lines or filled polygons) comprise the Picture Description Instruction (PDI) set of commands. Each PDI has 64 character positions for numeric data. PDIs are executable drawing functions that can produce images not restricted to a single character field since the PDIs do not consist of fixed pel patterns. The PDI set provides for highlighting, texturing and masking which can be used for display enhancement. Macro-PDIs, using image redundancy on locally stored data of related information frames, can reduce storage and transmission costs.
- Control-character functions can be used to produce text in a variety of sizes, to continuously scroll text onto the screen and to display complete words all at once (as opposed to one character at a time). Reverse video and underlining are possible, and the screen cursor can be steady, flashing or turned off. Designers and copywriters can repeat any type of character any number of times. Text blinking at user set intervals is also possible.
- There are provisions for partial screening and unprotected fields for use in applications such as ordering merchandise.
- System design is to support either seven- or eight-bit codes, allowing the host computer the choice.
- Upward compatibility with future, enhanced videotext terminals is provided for while retaining compatibility with existing systems.

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Find out how a distributed network of microcomputers can be much more cost effective than a minicomputer and have more computational power.

Intelligence Networks In the Office Environment

By Michael Brandt and Michael Bodner

Large computer systems cannot do the job for both small and large firms inexpensively and efficiently. The problems include inadequate servicing and maintenance, increasing software costs, substantial hardware expenses, large power requirements, special operating environments, data security and lack of customization.

Computer manufacturers are overcoming some of these problems with multi-user, multifunctioned systems. Several microcomputers are now available that perform quite admirably in these local distributed intelligence networks.

Networks offer an ideal solution to problems in office automation. Systems like Xerox's Ethernet permit communication among many office machines and computer devices. Thus, the businessman can take advantage of the microcomputer's price, while giving everyone access to mass storage devices and printers.

Such a network typically includes up to 64 user stations, or nodes, each with a microcomputer and video display terminal. The stations are linked to a central switching unit, which is responsible for overseeing data traffic within the network. This hub also contains a mass storage device, such as a hard-disk drive, which is shared by all of the nodes.

A micro network's advantage is that each user has a full computer which can be totally dedicated to any task that he or she desires. A time-sharing system uses only one computer, which must be used by everyone; it often takes much time for a user to gain access to the system.

An important feature is that stations can be dedicated to particular tasks. Thus, a printer station can handle all other stations' printing needs. Another station might be dedicated to electronic mail or communication with other computer systems.

Also, a distributed system has less downtime, since each station functions autonomously.

Other important features of local micro networks include:

- Private or shared data files for each system user.
- Centralized database use.
- Station-to-station communication.
- Low computing cost per user.
- The ability to be configured by user.
- Easy access and use.
- Constant computational power for all users, regardless of the number of stations being used.
- Low power requirements.
- Compactness.

Economic Analysis

A simple analysis of system hardware shows that a network of microcomputers is more cost-effective than a typical time-shared minicomputer with equivalent storage capacity. The central hub of the distributed system retails for about $20,000, and each user station costs an average of $2500 (not including peripherals). Assume that a typical time-shared minicomputer system costs $100,000 for the computer and $1000 per user terminal.

The processing power of a single-user microcomputer in the distributed network will be symbolized by the letter P and is about one-tenth that of the minicomputer. The processing power of the time-shared system, however, is inversely proportional to the number of users, N, in the system.

This all can be summarized by the four equations in Fig. 1.

Notice that the processing power of the distributed network is not dependent on the number of users in the system, since each user has a microcomputer of power P while the time-sharing system is dependent on the number of users. A comparison of the

Distributed Network

Cost = $20,000 + ($2500 × N)

Processing power of each micro in system = P

Typical Time-Sharing Mini

Cost = $100,000 + ($1000 × N)

Processing power of system = $(10 \times P)/N$

Fig. 1.

Michael E. Brandt is executive vice-president of technical operations for Synergos, Inc., 3333 Eastside Ave., Suite 210, Houston, TX 77098. He has been a technical writer for the past three years, and is a graduate biomedical engineering student at the University of Houston. Michael Simon Bodner is president and chairman of the board of Synergos, Inc. He is assistant professor in the radiology department of the University of Texas Medical School in Houston.

equations reveals that the computing power of the distributed network is equal to that of the time-shared system when each has ten users. Notice also that the distributed system costs less whenever the number of users of either system is less than 80. Thus, a distributed local network of microcomputers with 20 users has twice the power of, and costs one half as much as, a time-shared minicomputer with 20 users.

Ethernet

Ethernet is a high-speed, passive communications system that allows computers (minis and micros), computer peripherals and office machines to share data within an office or building. The Ethernet specification, including link protocol and transmission system, has served as the technical model for distributed networks of microcomputers. The network transmits data at rates of up to ten million bytes per second. A single network can support up to 1024 nodes over a maximum span of 2500 meters. Also, local networks can be interconnected.

The Xerox 860 information processor is one example of a microcomputer that uses Ethernet to exchange data with other microcomputer stations. Intel has also designed the Intellec Development System to create Ethernet applications.

Nestar

One of the first manufacturers to develop a local network of microcomputers was Nestar Systems, Inc., of Palo Alto, CA. Using the Ethernet concept, the Cluster/One Model A supports up to 64 independently functioning Apple II or III microcomputers.

The nucleus of the system consists of a dual eight-inch floppy disk drive, Winchester hard drive (up to 200 megabytes—200,000,000 bytes) and central file server (which is an Apple II). This processing unit runs the system software and manages the serving of files and programs to all local stations. The file serving software is written in Pascal and 6502 assembly language.

Each station consists of an Apple, a network interface card, video display monitor and a choice of several peripheral devices if desired.

There are two kinds of stations in a Cluster/One Model A: user and service stations. User stations are independent computing facilities that let the user access shared or personal data and resources in the network. Service stations provide execution of specific tasks for user stations. Service stations can be dedicated to spooled printing, electronic mail, communication with other Nestar networks and/or communication with other computer systems such as The Source.

The network uses a 16-wire ribbon-cable data bus (1000 feet total) that interconnects all stations in any linear or star-like configuration. Each station's network card connects the data bus to the host micro. This card consists of bus drivers, RAM buffers, and read-only memory(ROM) based system firmware. The cards do not contain microprocessors, thus reducing the cost of each. The 6502 microprocessor in each station's Apple executes the interface card firmware to perform the necessary protocols needed to access the network. Fig. 2 is a block diagram of a proposed Cluster/One Model A configuration.

> The Ethernet specification . . .
> has served as the technical model
> for distributed networks of microcomputers.

Corvus

One of Nestar's major competitors in distributed microcomputers is Corvus Systems, Inc., of San Jose, CA. They've developed two distributed systems of slightly different design from the Cluster/One Model A.

The Corvus Constellation is a local network consisting of up to 80 megabytes of hard-disk storage, an optional video tape backup storage unit of 120 megabytes, a master multiplexer and system bus for interconnecting up to 64 microcomputers. The central unit of the system is the multiplexer, which is a hardware-based device that polls up to eight computers or second-level multiplexers in a round-robin fashion. Each second-level multiplexer can support up to eight more microcomputers. A fairly wide variety of micros is supported in this system, including Apples, TRS-80s PETs, S-100 bus computers and DEC LSI-11s. The Constellation will support the operating systems of each of these microcomputers, and any station can communicate with any other station, regardless of differences in operating systems.

Like the Cluster/One Model A, each station in the Constellation has a full microcomputer, and peripherals such as printers, mass storage devices and plotters. Mail stations can be shared by all stations on the network. Data transmission on the system bus occurs at 60K bytes per second. The system can be configured by the user

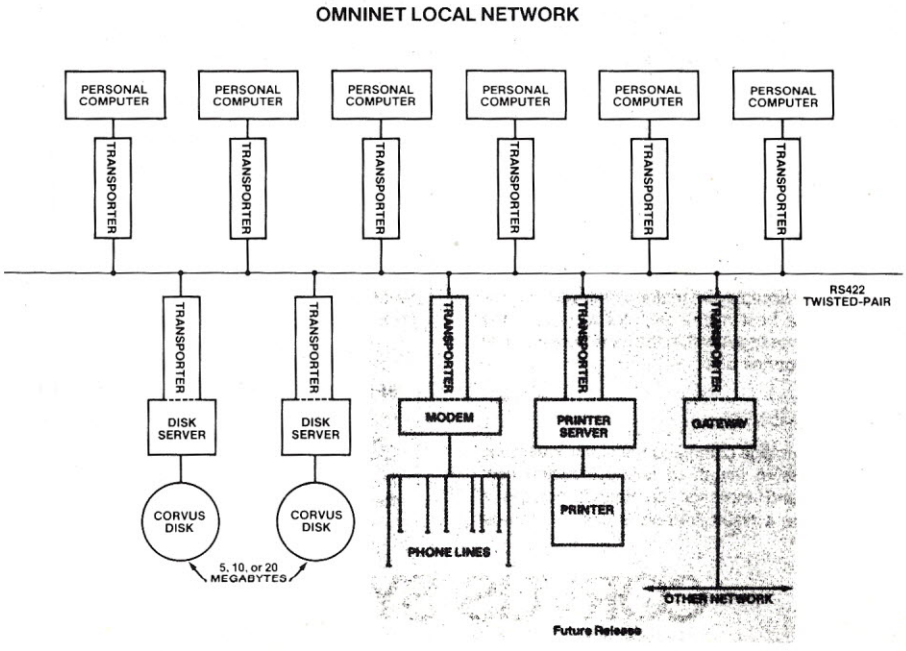


Fig. 2. The Corvus Omninet.

and is easily expanded without technical support. Multilevel security permits open or private access to data files or programs.

Corvus Constellation.

Corvus' other distributed-intelligence product is more in line technologically with the Ethernet philosophy. The Corvus Omninet is a passive-transmission multibus (RS-422 standard, twisted wire-pair) of up to 4000 feet total length. The bus can support up to 64 devices, each of which is interfaced to the Corvus Omninet via a controller card referred to as a transporter. Data transfers at one million bits per second and does not interfere with software running in any station's computer.

The network has no master controller (similar to Ethernet) so that network control is assumed by any transporter that has a message to send as soon as the network is available. Each transporter uses a 6801 Motorola microprocessor, with direct-memory access (DMA) data transfers to avoid message collision. Omninet does not require collision detection hardware. This helps to reduce system costs.

tercommunication. In addition to full station addressing, each transporter contains four separate data sockets which are individually addressable. Thus four different kinds of data or messages can be stored by memory buffers within the host microcomputer. Constellation software is available for use on Omninet, so that a particular network can make use of shared system resources (such as spooled printing). Fig. 2 is a simplified block diagram of Omninet.

Other Local Networks

Several other computer firms have developed distributed microcomputer networks with designs similar to those already described. One of the latest entries into the market is produced by Televideo Systems, Inc., of Sunnyvale, CA.

Televideo, known for its ASCII terminals, has recently introduced its System I, II and III microcomputer configurations. The heart of each product is a dual microcomputer/intelligent terminal. Each terminal consists of both 6502 and Z-80A microprocessors, along with 64K of RAM and 4K of erasable-programmable ROM (EPROM) for system diagnostics.

The System I is a single station configuration, and Systems II and III are multi-user. The System III is a multiprocessing and multitasking network that will support up to 16 work stations (each referred to as TS 80 satellites). The System III also includes a single circuit board service processor (referred to as the TS 86), 23.5 megabyte Winchester hard drive and magnetic tape cartridge backup unit.

The service processing proprietary software is referred to as MmmOST, which stands for multi-user, multitask, multiprocessor operating system technology. The standard operating system for the System III is CP/M (Control Program for Microcomputers) Version 2.2. Popular high-level languages such as FORTRAN-80, COBOL-80, PL/1-80, BASIC-80, CBASIC and Televideo's own version of COBOL run on the System III network.

Zilog, Inc., manufacturer of the popular Z-80 family of microprocessors, has developed a local network referred to as Z-Net, which combines data processing, word processing, management planning, shared re-

sources and network administration in a single package.

Other networks take advantage of popular microcomputers such as TRS-80 and PET. In the PET network, eight PETs share a common hard-disk drive, and in the Radio Shack network, up to 64 TRS-80s share a common hard-disk drive.

Applications

Word processing is one of the most frequent applications in distributed-intelligence systems. Word processing programs and text files are easily downloaded to individual work stations, and the use of hard-disk subsystems in most networks lets the user store many large files.

The major emphasis here is on savings in mass storage costs. The reason is that you can easily expand an office's word-processing capacity by simply adding additional computers, as opposed to buying an integrated single-station system. As the number of users in an office increases, the system cost decreases due to the sharing of storage.

Accounting and bookkeeping functions are conveniently handled in a local microcomputer network. There are many accounts receivable, accounts payable, payroll, general ledger and inventory programs for microcomputers. The same advantages for word processing hold true for accounting: large amounts of data can be stored, private or shared files can be accessed and system cost is reduced with increased users.

In electronic mail applications, dedicated stations can be equipped with modems to serve as communication links to other networks or mainframes anywhere in the world. Maps and other graphics can also be exchanged easily. This has applications in weather and traffic reporting, well-logging research, agriculture and many other industries.

Medical laboratory applications involve real-time processing of data from laboratory equipment such as blood analysis machines, ultrasound scanners, EEG and EKG equipment. Consider a laboratory where there are blood gas analyzers, and other blood analysis machines. Microcomputers could be interfaced to each machine to generate reports or run diagnostics, or to send data to a central hub for distributed hard-disk storage. Additional stations could be added for accounting, word processing and electronic mail for sending or receiving medical data from remote systems. Within this concept, an entire hospital or professional medical building could be wired for distributed real-time data processing, as well as business applications.

The concept of a distributed network of microcomputers would lend itself very nicely to developments in artificial intelligence. Since the brain seems to function as a parallel-processing device containing both analog and digital circuitry, microcomputers in a network could be used to emulate cell groupings in the brain. Although it would be impossible to simulate the functions of each neuron in the brain, a network of several thousand microprocessors, with full network intercommunication, could possibly simulate certain brain operations and is foreseeable in the not too distant future. Also the major advances in VLSI technology and array processing in combination with distributed networks will enhance progress in this area.■

See List of Advertisers on page 242

This incriminating evidence ties Emtrol Systems' Lynx in with the Great Telephone Connection Caper.

The Case of the Data Busters

By Frank J. Derfler

It was a cold and rainy afternoon. The door of our crummy office suddenly blew open and in walked a pathetic female figure in a cloth coat. You could see she was a looker, but her hair was wet and her face was streaked with rain—and tears.

"Derfler and Dreher, Dangerous Devices," I said and shoved a chair at her. "What can we do for you, sister?"

"Oh, I hope you can help!" she said. "My husband got himself a Lynx and now he won't come out of the basement. We have to take all of his meals down to him and he hasn't had anything to do with us in weeks."

"Gee, Lady," I replied. "Sounds more like a case for the humane society. They can just say, 'Here, kitty, kitty' and take it away."

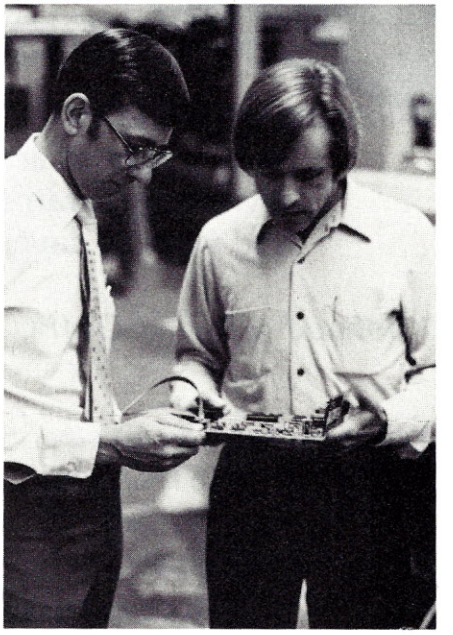
"Oh, no, you don't understand," she said desperately. "A Lynx is some kind of electronic thing. He plugs one end into his computer and the other end into the phone. He keeps saying he is talking to people and learning things, but none of us can ever hear anything. . . ."

"Sounds like a modem, Chief!" That observation came from the other half of the team, Dreher.

"Yeah," I agreed, "one of the most dangerous types of controlled devices. Addictive from the first minute you plug 'em in. OK, sister, it looks like your husband is hooked. He's an information junkie. He's probably a goner, but maybe the Data Busters can stamp out this information explosion before it spreads. Where did he get this thing?"

Rumors that Frank J. Derfler, Jr. (PO Box 691, Herndon, VA 22070) is starting up a computer network called Dragnet are entirely false.

We found this set-up in a back room. A Lynx connected to an Apple II. The Lynx will auto-dial and auto-answer, and it came complete with software. Guaranteed to hook some poor sap into being a data junkie. They sell 'em the whole deal for about $290.

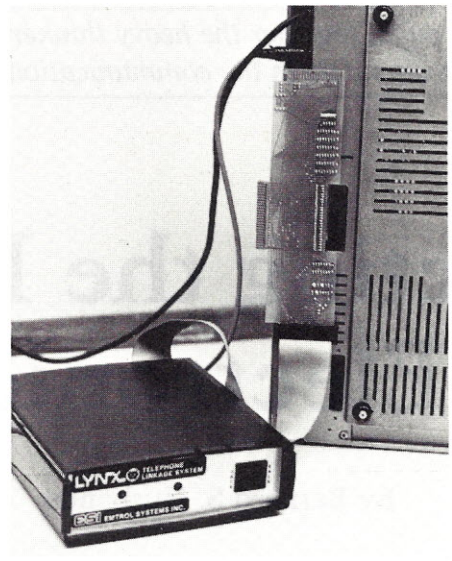


That's my partner Bob Dreher on the left. He's dressed in the undercover clothes he wears when he works for Apparat. He's confronting John Bickel, who claims to be the President of ESI Lynx, with a modem circuit board. Bickel is saying, "Honest, I don't know how it got here!"

She sobbed and handed me an advertisement from a place called Emtrol Systems in Lancaster, PA. In a flash Dreher and I were racing through puddles out to the data bus. We knew this could be the big bust.

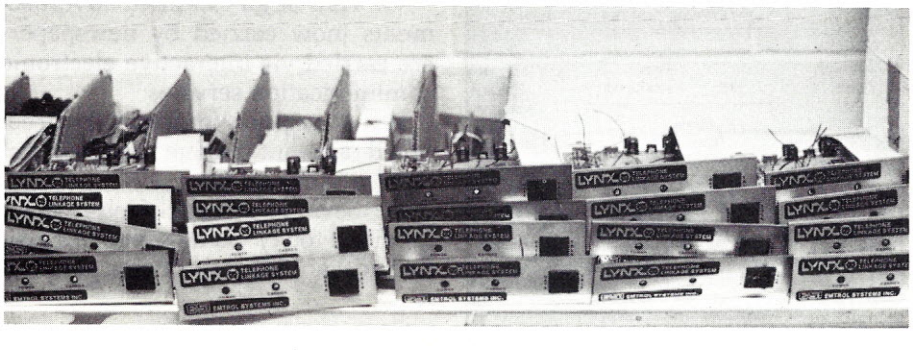
Lancaster turned out to be a quiet old town. Hardly the kind of place you'd expect information pushers to be operating. We slowed the data bus back to 110 outside of town and looked around. Dreher and I found the place and cut the sirens, bells, whistles and strobes outside the door. People started to empty out of the back ports and windows. We rounded 'em up and stacked 'em like ASCII bits in the back of the bus. Then we went inside.

The only guy left was named John Bickel. Claimed he was vice-president of the place. We made him show us around. I snapped these pictures with my eyeball camera. They tell the rest of the story. Bickel and his gang will probably be serving life at some place like the Grand Bahamas or Big Sur for pushing data products. ■



This Lynx is all set to interface with a TRS-80 Model III. The system doesn't even need a serial card! It just plugs right into the main computer data stream. The standard features include auto-dial and auto-answer, originate/answer, programmable word length, parity, stop bits and half/full duplex. It will work with both the Model I and Model III TRS-80 systems. The unit sells for $300, including software. Clever marketing designed to rope in as many information users as possible.

These Lynxes were all "burned in" and ready to go out the door. They pretest and burn in all of their units so their customers don't come back with complaints. A tough business!



These Lynx units were being assembled before Dreher and I arrived. Just the units pictured here have a street value of several grand.

This bulletin-board experiment brought together the heavy thinkers to predict the long-term effects of microcomputers in the communications field.

Predicting the Future With Electronic Mail

By Bernard S. Husbands

Last winter, the Telenet electronic mail service was used in a novel way. Under the auspices of the Telephone Software Connection, several system members participated in a Delphi forecasting experiment.

Delphi is a long-range forecasting technique developed and used by the Rand Corporation—the California think tank—in the early 60s. A panel of experts is gathered to consider a proposition. The panelists, independently of one another, suggest events which might occur in the future as a result of the basic proposition.

The events are submitted to a coordinator, who compiles a master list of events. These are then presented to each of the panelists, who then try to predict when the events will occur.

The coordinator gathers and summarizes the estimated dates for each event. If the estimate of a specific panelist departs from the group at large, the coordinator asks that panelist to reaffirm his position.

The compiled dates are then given to all of the panelists who, individually, reconsider their estimates, and adjust or modify them if they wish. This sequence may be done as long as there is a significant change in the collection of dates.

It is important in the Delphi technique that panel members' personalities not be allowed to dominate one another. A dominant personality does not necessarily imply a better-qualified opinion.

The Telenet Way

In the Telenet approach, several system members of Telephone Software Connection (TSC) volunteered to act as panelists. The system administrator of TSC dedicated a bulletin board, identified as "TELE.DELPI.A", to be used in the experiment. The coordinator posted the objective of the experiment, a target schedule and the proposition under consideration. The objective and the proposition remained on the board during the entire exercise. The schedule was updated to show progress.

The proposition used for this experiment was:

> From a historical perspective, the impact on the fabric of our society of the microprocessor—coupled with the communications media—may be seen as dramatic and profound. What events do you expect to occur within our culture as a result of this combination between now and the turn of the century—2000 A.D.—approximately 20 years?

The bulletin board was opened for discussion and comment to any of the system users. A week later the coordinator requested from the panelists the events they would predict based upon the above proposition. The coordinator compiled a master list of 20 predicted events:

1. The bulk (75 percent) of the television sets sold are manufactured with built-in microprocessors as standard equipment. Keyboards, printers, recording devices, modems, etc., are offered as after-sale add-ons.
2. All cable TV subscription services offer interactive (two-way) view-text programs.
3. The first distributed (i.e., geographically nonspecific) office is introduced.
4. Over half of the U.S. population has access to a personal videotext terminal.
5. Over 50 percent of personal (nonbusiness) banking transactions are performed via the home computer.
6. As an inducement to its customers a U.S. bank offers terminals to preferred customers for electronic banking.
7. A major invasion-of-privacy scandal forces the personal database systems into the courts, dragging down their development and forcing the enactment of an entirely new spectrum of privacy laws.
8. The total sales of electronic videotext news services within the U.S. exceed the total sales of newspapers.
9. Half of all classified advertisements (now carried by newspaper) are carried via interactive electronic communication services.
10. A regional/national bidirectional and interactive employment service is available.
11. Seventy percent of jobs (which are filled today via newspaper classified ads) are filled through a personal

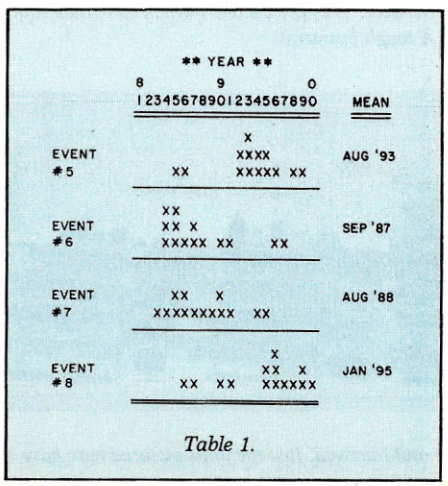


Table 1.

Address correspondence to Bernard S. Husbands, PO Box 666, Glendora, CA 91740.

videotext system.

12. A major retailer of the U.S. offers a regional merchandise purchase-exchange system which is fully bidirectional and interactive.

13. The U.S. Postal Service loses over half of its first-class letter service to the electronic mail systems.

14. High postal rates, high energy costs and material scarcities all combine to make videotext systems a major competitor in the magazine market.

15. The first home medical check-up service—via terminal with bio-monitoring—is offered as a regular service to subscribers.

16. Foreign electronic mail, with an automatic translation function, is tested.

17. A pocket-sized device is able to access a major library database remotely.

18. More time is spent working out of the home by middle managers than out of offices.

19. A national computer-assisted educational system is available to any regional school district with testing and scoring options.

20. Nationwide special-interest groups are available to anyone wishing to pursue a special field of information.

This list remained on the board for the rest of the experiment. The board was then again opened for discussion to all system users. After about a week the coordinator called for each panelist to submit to him, privately, his estimate of the two-year wide windows in which the event would occur.

The coordinator collected these dates, summarized them statistically and—after the bulletin board had been cleared—posted them in the form shown in Table 1.

Table 2 shows the distribution of predicted time windows for each of the proposed events, their mean dates and the degree of panel concurrence.

The board was again opened for discussion and the cycle was repeated. After the second cycle the final dates were posted and the board opened for questions and comments.

Levels of Interest

There were several levels of interest in this experiment. At one level was the chance to exchange ideas with other system users. At another level was the chance to learn of recent developments in the marriage of the microprocessor with the communications media. Most of the participants, unfamiliar with the Delphi concept, learned a new forecasting technique and how they might find applications to their own needs.

The subject considered and the events predicted, coupled with the forecast dates, gave the participants insight into possible scenarios of the future. The events themselves offered ideas for exploitation—perhaps self-fulfilling prophesies.

In general, the method let users participate in a game which they could not lose, conducted in a completely nonjudgmental environment. Almost all participants expressed satisfaction at having been a part of what may have been the first exploitation of the electronic mails for this purpose. ■

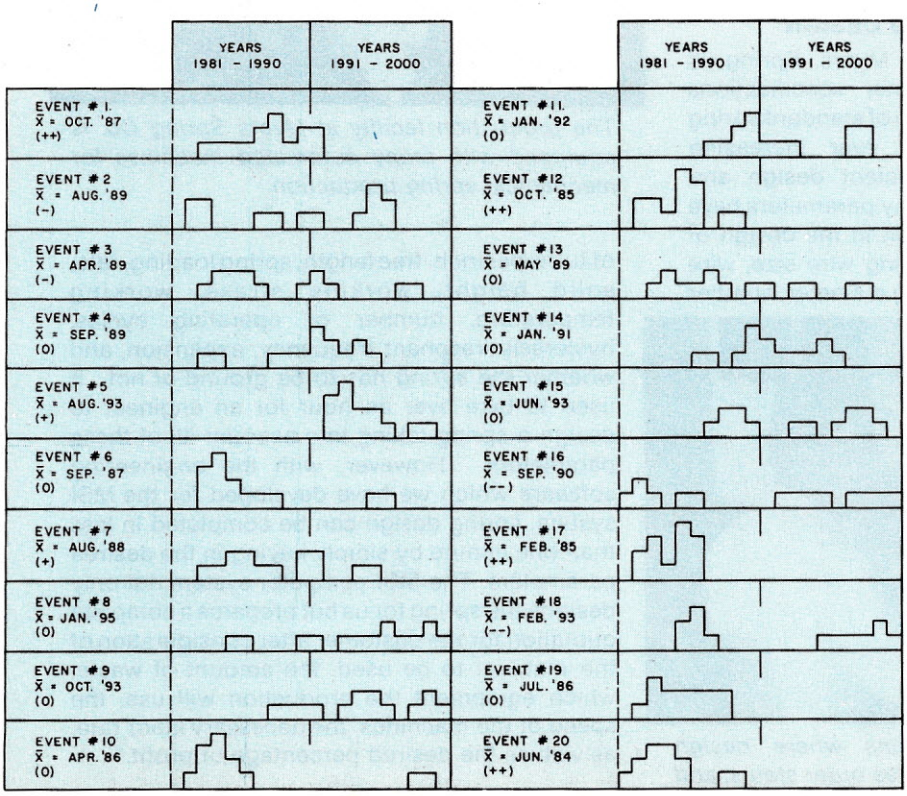
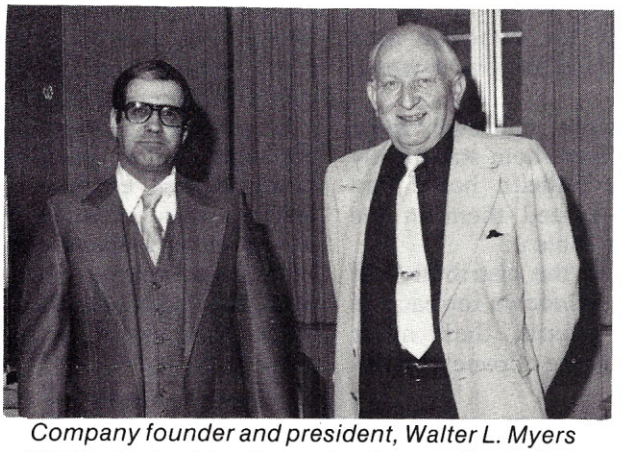


Table 2.

✓See List of Advertisers on page 242

ENGINEERING AND PRODUCTION CONTROL SYSTEMS



Company founder and president, Walter L. Myers (right), pictured with production engineer Joe Zellers who developed the production control software for the MSI computer system.

THE COMPANY:

MYERS SPRING COMPANY, INC.
LOGANSPORT, INDIANA

Myers Spring Company, Inc. was founded 35 years ago by Walter L. Myers for the manufacture of small mechanical springs which are used widely in mechanical appliances, electrical equipment, and by the automotive, construction, and many other industries. The Myers Spring company has grown to several million dollars in annual sales and employs approximately 50 people in its production facility.

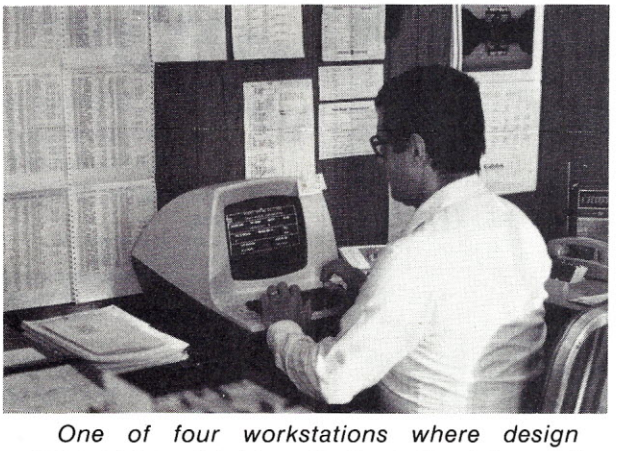
Production engineer Joe Zellers comments, "we began looking at computer systems approximately ten years ago in order to keep up with the increasing demand of order processing, custom mechanical spring design engineering, and production control. In 1975, we selected the MSI system because they were the first company in the microcomputer industry to offer the necessary peripherals which would convert a microcomputer system into a usable business system. Since 1975, the MSI system has been expanded to accommodate four users simultaneously, performing a variety of plant monitoring functions and management programs."

The production facility at Myers Spring Co. is equipped with many automated machines for mechanical spring production.

"The system is equipped with 10 megabytes of hard disk storage presently and we plan to add an additional 10 megabytes of storage soon. The maximum downtime has been only one or two days in the 5 years that the system has been in operation. MSI has provided excellent technical support and willingness to help us with our special requirements. We have nothing but praise for MSI, they have provided excellent system support."

SPRING ENGINEERING AND DESIGN

"All of the production at Myers Spring is performed to exact customer specifications rather than to the manufacture of standard spring products. This causes an ever increasing demand for quick and efficient design and engineering capabilities. Many parameters have to be taken into consideration in the design of any particular spring, including wire size, wire type, material modulus, spring diameter, number of turns per inch, free length, spring loading, rate, solid height, working stress, working temperature, number of operating cycles, hysteresis, resonant frequency, expansion, and whether the spring has to be ground or not. It used to take over an hour for an engineer to design a spring taking into account all of these parameters. However, with the engineering software which we have developed for the MSI system, spring design can be completed in less than one minute by simply keying in the desired parameters. The MSI computer system not only designs the spring for us but prepares a complete quotation for the customer after consideration of the material to be used, the amount of waste, which equipment the production will use, the speed of the machines, the necessary labor rate, as well as the desired percentage of profit."



One of four workstations where design engineering, checking of sales order status, and production control monitoring is performed.

SALES QUOTATION SYSTEM

Following the computer spring design procedure, with automatic quotation feature, the actual production begins. Each quotation is reviewed and compared to actual job cost reports on the production run in order to make any necessary refinements in the quotation system software. This feature of our system has greatly improved our ability to prepare accurate quotations and to insure profitability of the company.

PRODUCTION CONTROL/JOB COST ACCOUNTING

Each production work order is tracked by the computer system at each stage of the production process. First, each order is checked against the customer quotation for accuracy. As each order is processed, exact shop labor time is recorded, for each production machine used, and each stage of the production process. Summary reports are produced showing the total amount of material used, time used on each production machine, amount of material used, and a total cost figure for each work order.

SALES SUMMARY REPORTS

The system is designed to produce monthly sales summaries which show the amount of products sold by each salesman, complete with dates, order numbers, type of product, quantity, type of material, material cost, sales commissions, etc. Totals for each desired category and for each salesman are reproduced.

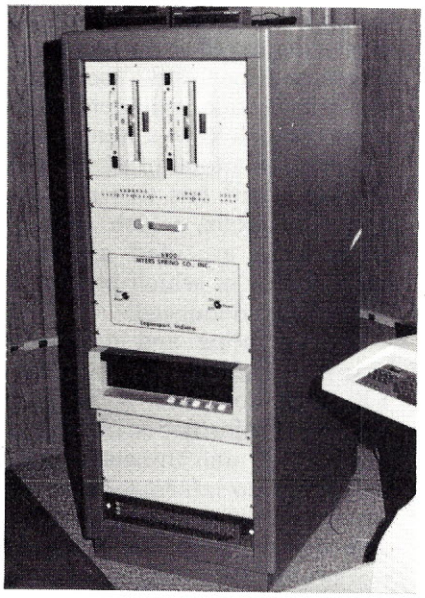
ACCOUNTS RECEIVABLE SYSTEM

Each morning, invoices are generated for orders which will be shipped that day. The accounts receivable system maintains accounts for over 500 active customers. The system produces monthly statements complete with aging of open invoices.

MULTI USER CAPABILITY

The MSI system is equipped with four user terminals presently which are available for use simultaneously by the following departments: Order department, for entering new orders and checking order status. Inventory department, used for checking to see whether a particular product has been produced previously. Invoicing/Cost Accounting, used for preparation of invoices and for entry of labor and material cost accounting information. Design Engineering, used by company engineers to design new products.

Order entry, invoicing, monthly statements, and other management reports are carried out at this workstation at Myers Spring Co.



The MSI system at Myers Spring Company is equipped with 10 megabytes of hard disk memory, dual floppy disk drives, a high speed printer, and four user CRT terminal workstations.

GENERAL LEDGER TIE-INS

The MSI system automatically prepares journals for cost accounting information and sales data which can then be posted to the general ledger. Complete income statements and balance sheets are produced by the general ledger programs on the system.

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The MSI system is used in many different areas of the company in order to provide more efficient and effective management of our production facilities. Several of the reports which we obtain from the system are: **production schedules, due list for orders, new orders list, production summary by department, salesman's reports, individual customer reports and order histories, time studies, sales quotations, design engineering, sales summaries, customer statements, general ledger balance sheet and income statements.**

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Sharp has set its sights on the American market, the business community in particular, with the introduction of the YX-3200 Business Computer.

Japanese Invasion: Part 2

By G. Michael Vose
Microcomputing Technical Editor

While Casio, Inc., is pursuing the scientific and engineering applications market (September's issue, p. 101), Sharp Corporation has its sights aimed squarely at the business computer market with the introduction of the Sharp YX-3200 Business Computer. From its professionally packaged documentation materials to its sleek, well-designed modular components, the YX-3200 was made to look like a natural part of the modern office environment.

Sharp is another Japanese company with a strong background in the consumer electronics market. I remember buying a Sharp television set back in 1969. Since that time, Sharp has made everything from radios and tape recorders to video cassette recorders and calculators.

Tandy Corporation of Fort Worth, TX, sells a pocket computer, called the TRS-80 Pocker Computer, for which Sharp is the OEM (original equipment manufacturer). As with many Japanese companies, Sharp is a vertically structured organization that not only produces finished products, but a great many of the individual electronic parts as well. This helps to keep costs down and to assure quality control.

The Sharp YX-3200

My first impression of the YX-3200 was positive. It is a very attractive unit. The computer I tested came from a Nashua, NH, office products dealer, Young Sales and Service. It consists of a separate keyboard, mini-floppy disk drive, video monitor and an Epson MX-80 printer. The combination high-density plastic and metal cabinets of the computer are striking in design; they possess a futuristic, 21st century look. The cabinets are cream colored with electric blue trim. The high-gloss finish on the metal housing of the disk drive unit and the video monitor contrasts with the non-slip textured finish on the plastic keyboard cabinet.

The YX-3200 is nicely human-engineered. The video display monitor has its own separate stand that allows the screen unit to be swiveled up or down to adapt to the viewer's height and posture. The disk drive unit can also be tilted upward to provide easy access to the doors of the two individual drives. The cables connecting the disk and video modules to the keyboard are long enough to permit setting these devices up to a foot apart.

There are four different colored keys on the YX-3200 keyboard. The function keys are light gray and the character keys are dark gray. Special user-programmable keys are white and the HALT key is blue. This color coding makes these keys easy to find.

At the heart of the YX-3200 is a Z-80 microprocessor. The BASIC interpreter and system firmware is stored as a 32K byte ROM; standard programmable RAM is 64K bytes, upgradable to 128K. Characters are generated using standard ASCII codes. ROM is located in low memory.

The video display allows either 80 or 40 columns of 25 lines to be displayed on a green phosphor screen. The YX-3200 supports color video as well but comes standard without the color monitor. The graphics display mode invokes high-resolution graphics; there is only a brightness control on the standard monitor for adjusting screen images.

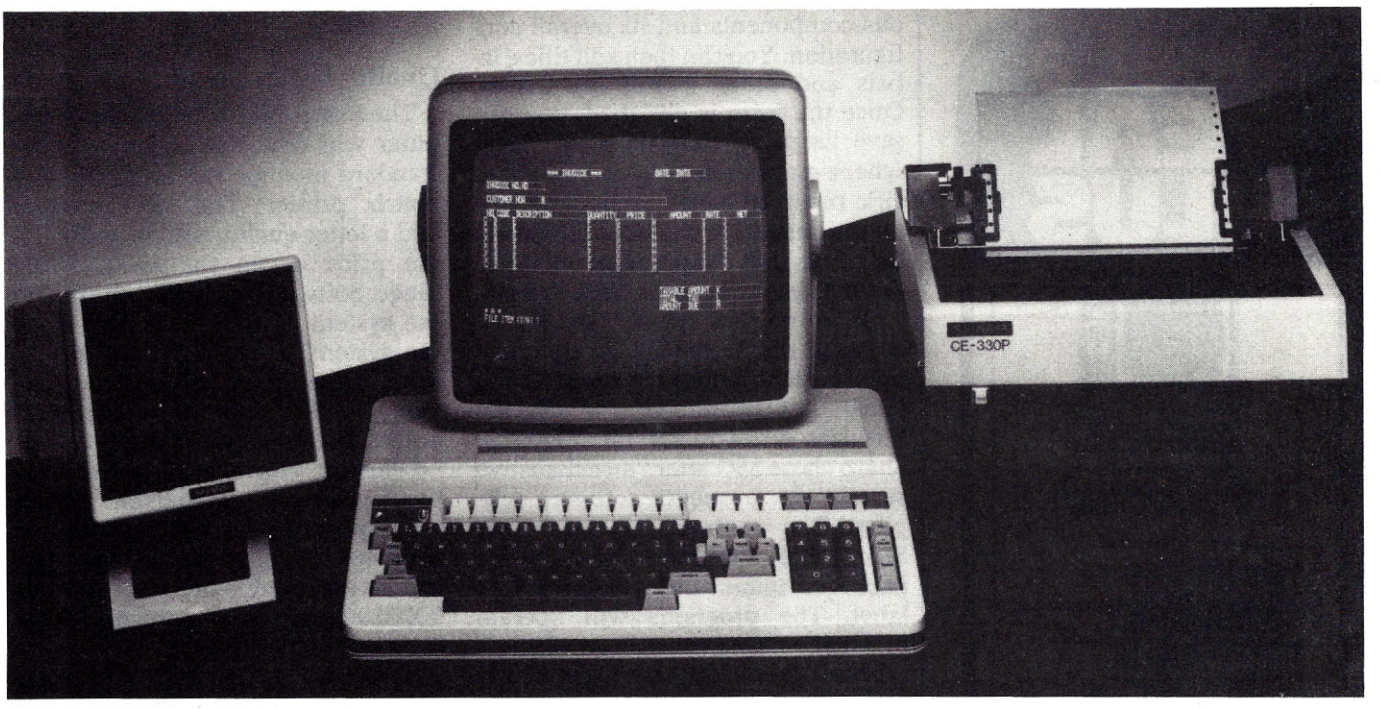
The keyboard has four kinds of keys: character keys, control keys, function keys and command keys. The function keys are user programmable; the character keys include both alphabetic character keys and a separate numeric keypad; the control keys include home(clear screen), rep (repeat), enter, shift, etc.; and the command keys allow single keystroke invocation of the RUN, INS(insert), DEL (delete), EDIT, BRK(break), HALT and CONT(continue) commands.

There is one further key, the C/L (clear) key, whose function is a bit annoying. Anytime a system error is generated, a short beep is sounded over the on-board speaker, the error message is displayed at the bottom of the screen and the system locks up. The only way to unlock the computer is to press this C/L key—a minor hassle.

There are a total of 92 keys in all. The keyboard has two modes—the operation mode, which allows programs to be executed, and the program mode, in which programs are written and debugged.

The operating and programming manual that accompanies the YX-3200 contains a substantial amount of information about Sharp's BASIC but, unfortunately, contains absolutely no information about the system's disk operating system and disk drives. Since the system only works with disks, this is a major oversight.

The programming manual also contains no information on Disk BASIC commands for disk I/O and disk file manipulation. Sharp reportedly has written a floppy disk manual that contains this information plus the disk-operating system commands and instructions, but this manual was not available in early August. A re-



The YX-3200 Business Computer includes a central processor unit, a high-resolution green CRT, dual-sided double-density floppy disk drive and an impact printer. Price is $5000 with the standard monitor and Epson dot matrix printer; $7000–$8000 with a color monitor and letter-quality printer.

ported printer manual was also unavailable in early August. The manuals are fairly well organized, and the Japanese-to-English translation has been handled moderately well, with only minor syntactical errors.

Sharp BASIC

A business computer needs a programming language that is universal and adaptable, and Sharp has chosen BASIC for the YX-3200. Sharp's Business BASIC is very powerful, combining the best features of the microcomputer BASICs used by Radio Shack, Apple, Atari and North Star. In addition, Sharp Business BASIC can be used to program music similar to the Enhanced Color BASIC used in the Radio Shack Color Computer.

Sharp Business BASIC employs standard BASIC commands as well as the machine-level access commands like PEEK, POKE and USR. The resident editor is a line editor that can be called by keying in the command's letters or by using the special function edit key at the upper right-hand side of the keyboard. The other special function keys include run, insert, delete, debug/edit, continue, break and halt.

The YX-3200 will run the following program in two minutes, 29 seconds:

```
10 FOR X=1TO1500
20 DISP X
30 NEXT X
40 END
```

The TRS-80 Model III will run the same program in 48 seconds (line 20 would be PRINT X). This lack of speed will make the YX-3200 seem sluggish on big number-crunching jobs. I would look for some machine-language software for sorting and data manipulation if I were going to buy this computer.

The wide variety of formatting commands available in Sharp Business BASIC will make it possible to develop professional-looking displays. These commands include FIXED, which allows setting the decimal point and rounding data, all with the same command; and FLOAT, which allows setting the decimal point and rounding data when using very large or very small numbers. Sharp Business BASIC also contains the command, TABLE, which uses 11 different graphics symbols to produce a series of boxes on the screen that can be labeled and used as a table to display data.

Sharp Business BASIC makes it easy to scroll displays on and off the screen from all four directions. There are commands to invoke an inverse video display and several commands to position and manipulate the cursor. The MUSIC command lets you write your own melodies to accompany your screen displays, and the keyboard has a small speaker/amplifier to "play" your tunes. There is a command to change the screen display from 80-column to 40-column (and vice versa) and another to call up to eight different colors for display if you use a color monitor.

These display-formatting commands make Sharp Business BASIC a good business programmer's language; they also make the language fairly complex. With the large number of commands and their associated arguments and syntax, large programs could become nightmares to debug. I don't imagine that too many business people will want to invest the time necessary to develop good programs that take full advantage of the power of Sharp Business BASIC. Therefore, software support of the machine becomes very important, particularly for a business computer.

Software and the YX-3200

Sharp has tackled the problem of software support from two different angles. First, they have produced an automatic program generator that comes with the computer when you buy it, and second, they have signed a deal with a software firm to provide software support.

The automatic program generator is basically a report design system. It allows you to design forms, logs, ledgers or any other kind of report. This is accomplished by answering questions posed by the generator program. These questions allow you to specify the size of the form, its vari-

ous components and its overall configuration. You can then add titles, labels and other identifying marks. Once the form is designed, you can save its parameters on disk. Then, whenever you need to generate a specific report or series of invoices, call up the desired form, input the necessary data, and the program will print out the finished report, data and all.

On June 30, 1981, Sharp announced that it had signed an agreement with Structured Systems Group (SSG) of Oakland, CA, to provide business software for the YX-3200. Sharp chose SSG after "an exhaustive search" for a quality software supplier. The contract stipulates that Sharp will distribute the software packages under their original SSG label. The programs will operate under the CP/M operating system.

This kind of software support will make the YX-3200 attractive in the American marketplace. Many industry experts have been predicting that Japanese computers would not sell in this country, even if they were inexpensive, because of a lack of software support. Sharp obviously does not intend to let that happen to the YX-3200.

Quality Is Not Cheap

The Sharp YX-3200 Business Computer will retail for $5000 with the standard monitor and an Epson dot-matrix printer. The color monitor and a letter-quality printer will raise the price up to the $7000–$8000 range. Software will add to the cost of the system as well. This will make the system as expensive as, and in some cases more expensive than, many similar American microcomputers. In this respect, the YX-3200 is no bargain. However, it is an attractive, well-made expandable system with strong capabilities. It is S-100 and IEEE-488 bus compatible. The disk drives are double-density, and the YX-3200 can accommodate either 5-1/4 or 8-inch drives.

If you are shopping for a business computer, visit a Sharp dealer and ask to see the demonstration program that Sharp has developed for the YX-3200. It shows the system's powerful formatting capabilities, as well as the system's lack of speed. For the purpose of comparison shopping, I think you'll find it interesting.■

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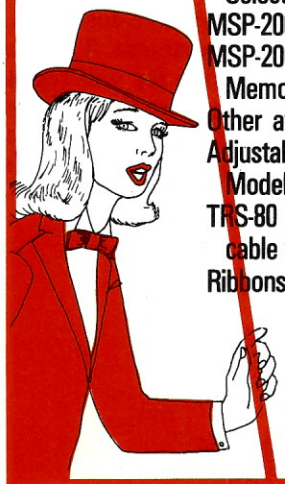

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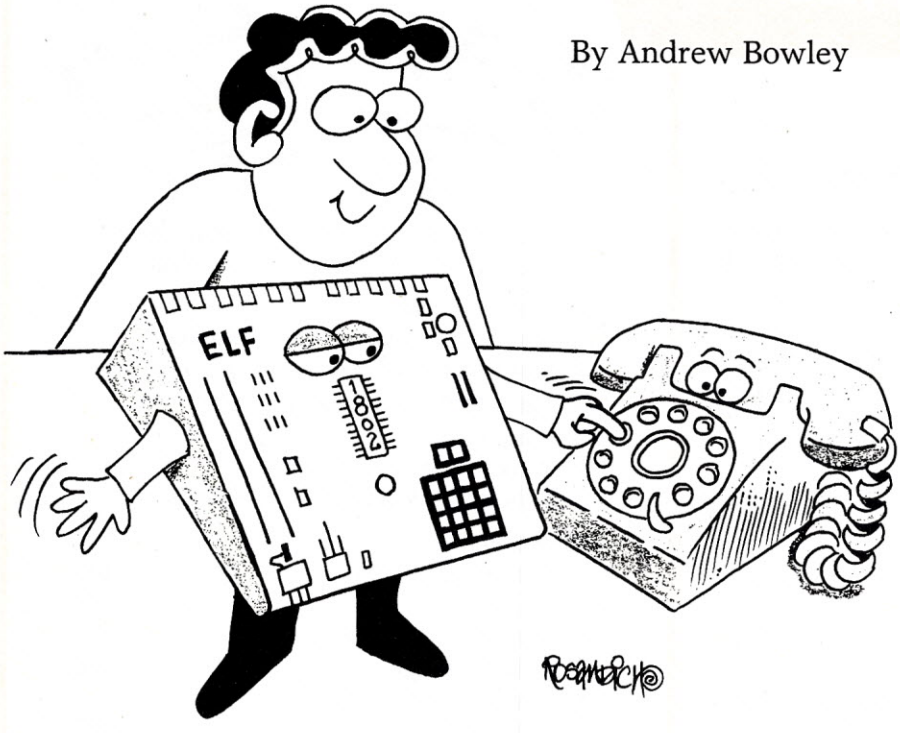
Let your Elf do the walking with this simple telephone interface.

An 1802 Phone Dialing System



By Andrew Bowley

Like a lot of other microcomputer enthusiasts, I got myself started with an inexpensive system based on the 1802. For about $100, I bought an Elf II from Netronics R & D in New Milford, CT. And after fiddling around with 1802 machine language for a few weeks, I came to the conclusion that I would never be able to program my Elf to be a number cruncher. So I turned to experimenting with controller applications.

Since then, I have hooked up almost every conceivable piece of hardware to my Elf II. And one of the most exciting applications that I have found has been hooking up my Elf to the telephone as a dedicated dialer. The process is simple—so simple, in fact, that both the hardware and the software can easily be adapted to almost any other kind of system.

Address correspondence to Andrew V. Bowley, 4 LaForge Road, Darien, CT 06820.

Theory

As you can see in Fig. 1, a telephone is simple once the bell circuit has been removed. This circuit could actually function as a bell-less telephone.

The dialing device may also be a little simpler than you thought. The dials on all rotary phones are nothing more than on/off switches. Whenever a rotary phone is dialed, the user is, in effect, interrupting the line between the handset and its terminal. For example, when the number seven is dialed, the dial switch is opened and closed seven times. The computer application is quite simple. Using a computer-controlled relay between the handset and the phone terminal, the line can be interrupted effectively.

Hardware

The 1802 produces a 5-V controllable strobe from its bus which is labeled Q. The Q strobe won't activate the dialer relay by itself, so I use a circuit (see Fig. 2) that appeared in a *Popular Electronics* article by Joseph Weisbecker (September 1976). When everything is installed correctly, the Q strobe from the bus should activate the switching transistor, which in turn will open the dialer relay. Make sure that the relay can handle at least 80 V.

Installation

Installation is simple. The diagram in Fig. 2 should be self-explanatory. The idea is to interrupt either the red or the green lines that go between your telephone and its terminal box. Disregard the other two leads that come from the box. They are both used for the bell circuit. If, for some reason, the telephone leads are not the same colors as I have described, it won't hurt to experiment. The leads that you are looking for will register about 50 V. (If you turn the dial slowly, the voltage should fluctuate from 50 to zero.) The bell leads shouldn't

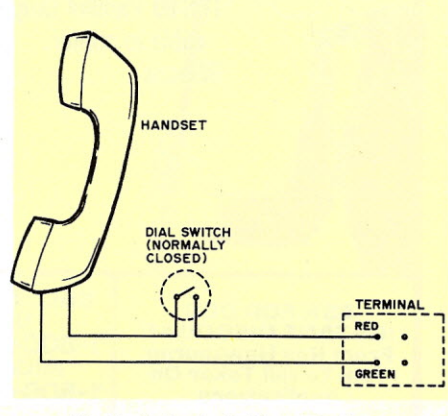


Fig. 1. A simple, bell-less telephone.

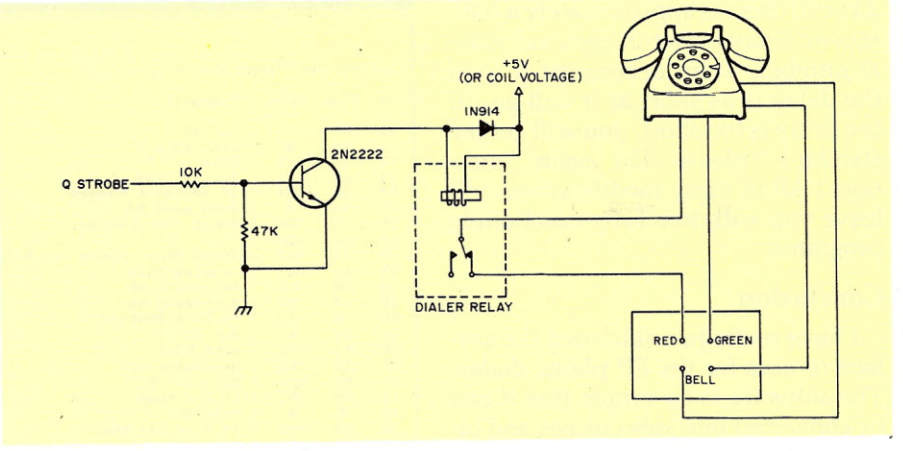


Fig. 2. Complete phone dialer circuit.

register anything unless the telephone is actually ringing.

Software

This application's best feature is the amount of memory that it uses. Even if you own the tiniest 1/4K system, there is a lot of room for modification.

I wrote two programs for the phone dialer system. The first, which I call Touch Dialer, takes up only 33 bytes. All it does is convert a rotary dial phone into a push-button phone that is controlled by the Elf. It will dial numbers as they are entered on the keypad. Enter 01 for the one, 02 for two and 0A for zero.

The second program, which I call Auto Dial, is a little more complicated. It takes up 58 bytes of memory and will store about 18 numbers in a 256-byte system. Before you run Auto Dial, put the numbers that you want to dial into memory starting at location 40. Use 01 for one and 0A for zero as I described before. Separate each set of numbers with 00. For example, if I wanted to dial 650-2734, I would enter (starting at location 40): 06,05,0A,02,07,03,04,00. The 00 would signify the end of the number group.

When Auto Dial is run, your Elf will display a "01"—indicating that the first number set is about to be dialed. When a switch connected to $\overline{EF4}$ is pushed (this is labelled the input switch on most 1802 systems), the number will be dialed and the display will advance to 02.

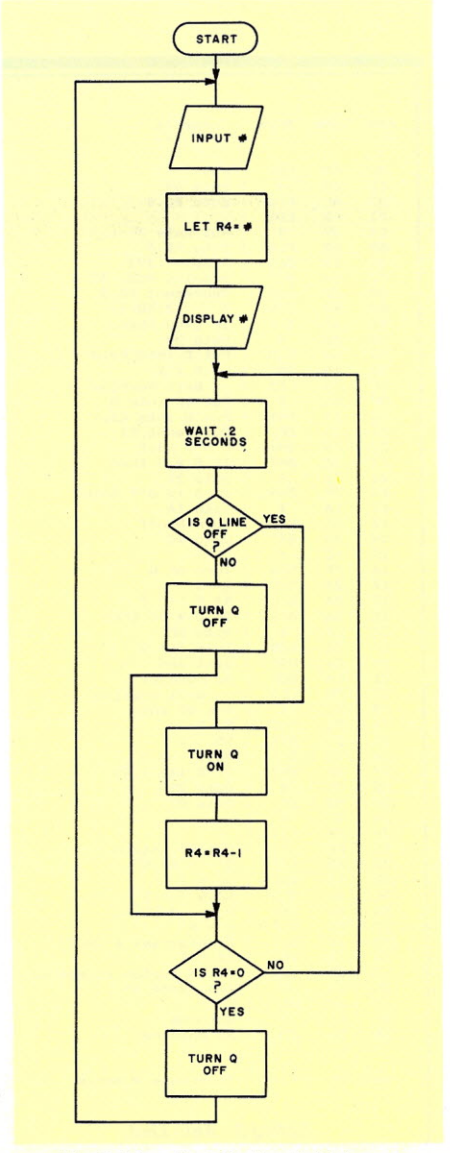


Fig. 3. Flowchart for Touch Dialer.

Modifications

The two programs that I wrote were developed on a Netronics Elf II. The Elf II uses a common 3.5 MHz TV crystal and splits the frequency so that it will run at about 1.8 MHz. If your system runs faster or slower than this, you may have to modify the delay routines in both of the programs. (If you own a Super Elf, don't worry about this.) If your system runs faster, then modify all of the routines with higher numbers. If your system is slower (a lower crystal frequency), modify with smaller numbers.

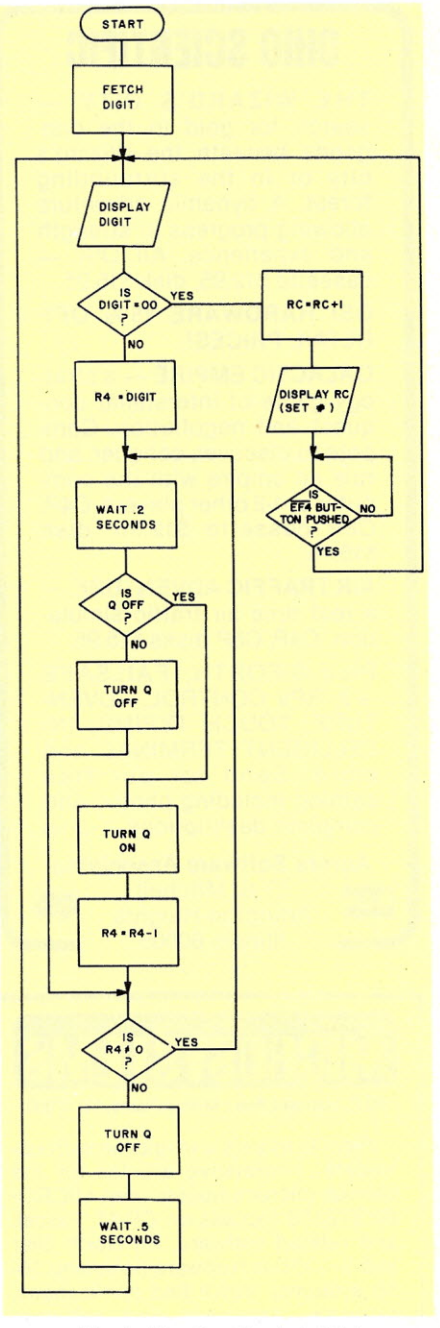


Fig. 4. Flowchart for Auto Dial.

The Touch Dialer program includes a routine that puts in a short delay every time the Q line is turned on. Modify the byte in location 0D until the telephone line accepts the numbers as they are dialed. Each delay should be roughly one-sixth of a second long.

Auto Dial has an identical routine. So take the byte that was just put into location 0D and put it into location 0F of Auto Dial. You will also have to modify another routine in Auto Dial. Fool around with the byte at location

23 until there is approximately a half-second delay between each individual number. Then decrement it until the delay is as short as it will go. (If the delay is too short, you will get the standard "please dial again" message.) All of these modifications will leave you with two fully-functioning programs.

Conclusion

I have really just skimmed the surface of uses for the Elf phone dialer. The software is so simple that it can be converted into subroutines and integrated into your own programs. If you have a burglar alarm system, you can set your Elf to call the police when there has been an intrusion. You can also modify the Auto Dial program to dial frequently-used numbers at the push of a button. The possibilities are endless.

But if you don't own an Elf or an 1802 system, don't despair. If you use the flowcharts, you can write a dialing program for your own system. It's well worth the trouble. Its simplicity, its low cost and its usefulness make a phone-dialing peripheral truly fun to experiment with. ■

```
Listing for 'Touch Dialer'

Add  Code  Mnem   Comments
---  ----  ----  --------
 00   F8   LDI  ; Put BB
 01   BB    *   ; into RB.0
 02   AB   PLO  ; RB.0 --> D
 03   EB   SEX  ; X = BB  [RB.0]
 04   3F   BN4  ; If IN isn't pushed
 05   04    *   ; Then goto 04
 06   6C   INP  ; Input from keypad
 07   C4   NOP  ;
 08   A4   PLO  ; Input from keypad --> R4.0
 09   64   OUT  ; Display R4.0
 0A   2B   DEC  ; Decrement RB
 0B   14   INC  ; Increment R4
 0C   F8   LDI  ; -- Wait Routine --
 0D   05    *   ; Put 05
 0E   B3   PHI  ; into R3.1
 0F   23   DEC  ; Decrement R3
 10   93   GHI  ; R3.1 --> D
 11   3A   BNZ  ; If D ≠ then
 12   0F    *   ; goto 0F
 13   39   BNQ  ; If Q is off then
 14   18    *   ; goto 18
 15   7A   REQ  ; Turn off Q
 16   30   BR   ; Goto 1A
 17   1A    *   ;
 18   7B   SEQ  ; Turn on Q
 19   24   DEC  ; Decrement R4
 1A   84   GLO  ; R4.0 --> D
 1B   3A   BNZ  ; If D = then
 1C   0C    *   ; goto 0C
 1D   7A   REQ  ; Turn off Q
 1E   30   BR   ; Goto 04
 1F   04    *   ;
 20   00   IDL  ; Do nothing
```

Listing 1. Touch Dialer.

```
Add  Code  Mnem   Comments
---  ----  ----  --------
                 ;
 00   F8   LDI  ; Put
 01   00    *   ; byte 00
 02   AC   PLO  ; into RC.0
 03   F8   LDI  ;
 04   39    *   ; Put byte 39
 05   AB   PLO  ; into RB.0
 06   EB   SEX  ; X=RB.0 [39]
 07   64   OUT  ; Display Add. 39
 08   2B   DEC  ; Decrement RB.0
 09   4B   LDA  ; D --> M(RB.0)
 0A   32   BNZ  ; IF D=00 then
 0B   2B    *   ; Goto 2B
 0C   A4   PLO  ; Put D into R4.0
 0D   14   INC  ; R4.0 + 1
 0E   F8   LDI  ; -- Wait Routine --
 0F   05    *   ; Put 05 into D
 10   B3   PHI  ; Put D into R3.1
 11   23   DEC  ; Decrement R3
 12   93   GHI  ; D --> R3.1
 13   3A   BNZ  ; If D ≠ 0 then
 14   11    *   ; Goto 11
 15   39   BNQ  ; If Q is off then
 16   1A    *   ; Goto 1A
 17   7A   REQ  ; Turn Q off
 18   30   BR   ; Goto 1C
 19   1C    *   ;
 1A   7B   SEQ  ; Turn on Q
 1B   24   DEC  ; R4-1
 1C   84   GLO  ; R4.0 --> D
 1D   3A   BNZ  ; If D ≠ 00 then
 1E   0E    *   ; goto 0E
 1F   7A   REQ  ; Turn off Q
 20   C4   NOP  ; wait and
 21   C4   NOP  ; do nothing
 22   F8   LDI  ; -- Wait Routine --
 23   50    *   ; Put 50 into
 24   B5   PHI  ; R5.1
 25   25   DEC  ; R5 - 1
 26   95   GHI  ; R5.1 --> D
 27   3A   BNZ  ; If D isn't 00
 28   25    *   ; Goto 25
 29   30   BR   ; Goto 07
 2A   07    *   ;
 2B   F8   LDI  ;
 2C   FF    *   ; Put FF into D
 2D   AD   PLO  ; D --> RD.0
 2E   1C   INC  ; RC + 1
 2F   8C   GLO  ; RC.0 --> D
 30   5D   STR  ; D --> M(RD.0)
 31   ED   SEX  ; X = D
 32   64   OUT  ; Display set # [RC]
 33   2D   DEC  ; RD - 1
 34   3F   BN4  ; If IN button is pushed
 35   34    *   ; then goto 34
 36   30   BR   ;
 37   06    *   ; Goto 06
 38   00   IDL  ; Do nothing

 40 - FF  ---    Telephone Numbers
```

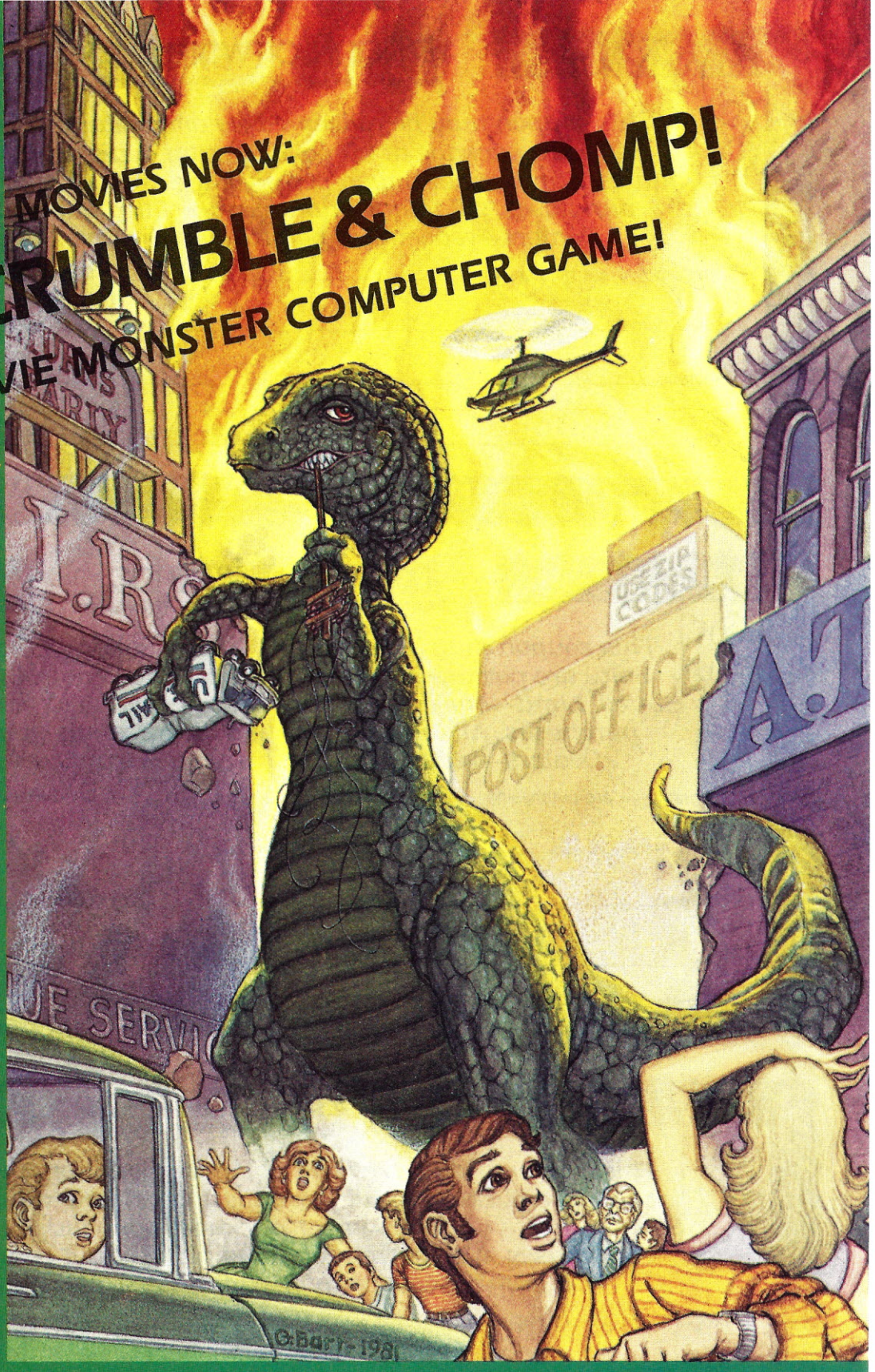
Listing 2. Auto Dial.

Reader Service for facing page ↙55→

FIRST: MONSTER MOVIES NOW:

CRUSH, CRUMBLE & CHOMP!

THE GREAT MOVIE MONSTER COMPUTER GAME!



And guess who stars as the movie monster. You! As any of six different monsters. More if you have the disk version.

You can terrorize and destroy four of the world's largest and most densely populated cities in over 100 possible scenarios. From Tokyo to the Golden Gate, you are the deadliest creature in the air, on the land, or in the sea.

You can be the deadly amphibian who simultaneously smashes street cars, lunches on helpless humans and radiates a ray of death.

If you were a giant winged creature, think of the aerial attacks you could make on the terrified but tasty tidbits beneath you.

But as in all the best monster movies, you're up against everything the human race can throw at you—even nuclear warheads and a strange concoction developed by a team of mad scientists.

For only $29.95 you get 6 stupendous monsters, each with its own monstrous summary card, 4 teeming metropoli displayed in graphic detail on your computer display and mapped in the accompanying 48-page illustrated book, the awesome sounds of monsterly mayhem, and spine-tingling, real-time, edge-of-your-seat excitement.

GET CRUSH, CRUMBLE & CHOMP
now at your local dealer for your APPLE, ATARI, or TRS-80 . . **before it's too late.**

COMPUTER GAMES THINKERS PLAY

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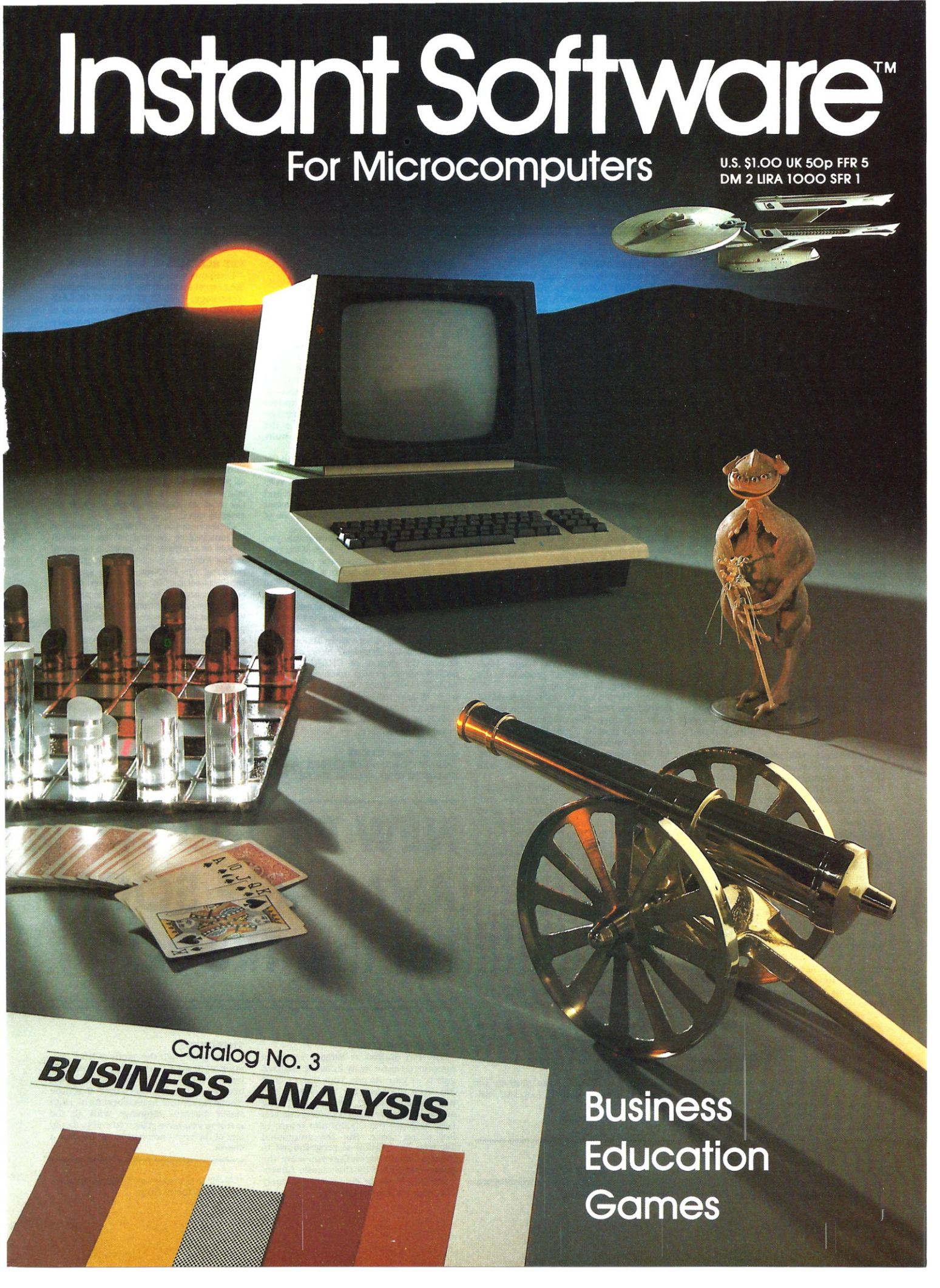

Catalog No. 3

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Business
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Games

ALL NEW!!

Instant Software™

NEW PRODUCTS

TEMPLE OF THE SUN

Your quest for the ancient Rites of the Shaman has finally led you to a remote South American ruin, long rumored to be the legendary TEMPLE OF THE SUN. Now, at last you are able to explore the site for the last clues to the most powerful order of Wizards left in the world. Octo-directional, the matrix of this adventure is nearly endless, as are the ways to die.
Model I, Level II, 16K.
5012R (Tape) $19.95
5011RD (Disk) $29.95

THE RUSSIAN DISK

Well, here it is: THE RUSSIAN DISK. Everything your APPLE computer needs to put you into the international picture. Instant Software has packed two multi-part packages onto this single disk, so that you can master the Russian (or Cyrillic) Alphabet in no time flat, learn to type in Russian, and to read and recognize a variety of Russian words for foods, drinks, stores, and even names.

The first set of programs eases you through the Cyrillic alphabet in short, rapidly digested and thoroughly exercised steps, starting with those letters which most resemble the English counterparts and introducing the more exotic ones bit by bit. Enjoy that lift which comes from the discovery that you have learned the entire Russian alphabet, almost without trying.

The second set of programs develops your reading ability in Russian, and expands your Russian vocabulary as well. You'll learn the words for various foods, drinks and places to eat, for signs and names of stores—everything the traveller needs to know.

Furthermore, the program will allow you to practice typing in Russian, using the Cyrillic characters. Recommended age level, 10 to adult.

RUSSIAN DISK requires 32K RAM, one disk drive, an Apple II or Apple II Plus and Applesoft.
0283AD (Disk) $24.95

MASTER REVERSI

Are you looking for a game you can spend hours with; a game that's simple to play, yet infinitely challenging; a game that you can play with a friend, or against your computer in the wee hours of the morning; a game that can be played at parties, and at serious tournaments?

Look no farther! Master Reversi will meet all your needs!

Master Reversi is a tournament-winning game program that has more features than any other reversi program on the market. It will challenge and teach you no matter what your degree of expertise.

What makes Master Reversi really special is its ability to allow in-depth analysis of moves and games. You may examine the computer's evaluation and choice of moves. You can save and replay interesting moves and games. You will be able to study and manipulate dozens of tournament-level games which are provided in the program's vast library.

Master Reversi will enable you to overcome any barriers standing between you and a world championship.
Model I, Level II, 16K.
0378RD (Disk) $29.95

CAPITALIZATION

As the first module in the Instant Software Aided Instruction (CAI) English Language Series, CAPITALIZATION is an educationally solid program for the teaching and review of the rules governing capital letters. With this program and an Apple computer, the student, the writer, the reporter—anyone can learn or review the 12 fundamental rules of capitalization quickly and effectively.

The program is designed for students of junior high school level and beyond. Each rule is concisely explained on the screen, and examples are given. Next, the student is allowed to exercise the usage of the rule. The computer keeps score and reports the level of mastery at the end of each set of exercises. The student may then choose to study the next usage, or may return for further practice to the previous exercise. A Model Mastery Worksheet is included in the documentation as an aid to teacher and student. CAPITALIZATION requires 32K, one disk drive and an Apple II or II Plus with Applesoft Basic.
0339AD (Disk) $24.95

SPACE SHUTTLE

Inside the cockpit of the space shuttle, Columbia, the pale green light from three computer driven TV screens illuminates the craft's 1,400 switches and circuit breakers. The Command Pilot gives the necessary instructions to begin what NASA calls the "deorbit" procedure. It's time to bring this baby home.

Just 55 hours ago, 5.3 million pounds of thrust from two solid fuel boosters, essentially 15-story firecrackers, sent the somewhat chubby Space Shuttle into orbit. Now, on-board computers performing 325,000 separate operations every second will help guide the craft safely and gracefully back to its roost.

Over the Indian Ocean, the OMS engines burn for two minutes to slow the craft down from its orbital speed—a speed equivalent to 25 times the speed of sound! The shuttle craft begins to drop and is turned nose up so that its tile coated belly will absorb the enormous heat of reentry. Those 34,000 silicon glass tiles are all that prevent the craft from being burned up. Thirty-five minutes later, the orbiter enters the Earth's atmosphere over Midway Island. By now, the shuttle is banking and flying wide traverses to control its speed. The strain on its superstructure is tremendous. Finally, the runway at Cape Canaveral is dead ahead. At 190 miles per hour, the shuttle touches down and ends its perilous journey.

Instant Software's SPACE SHUTTLE puts you in the Command Pilot's chair of one of America's first reusable space vehicles. You will bring her back from space. Simply stated, this will be the most fascinating and breathtaking experience you will have until the space shuttle becomes a commuter run.

SPACE SHUTTLE is the ultimate air flight simulation. Model I, Level II, 16K; Model III, 16K.
0332R (Tape) $14.95

USER'S TIPS

Never remove a floppy disk from its protective plastic casing.

DRAGONQUEST
THE PRINCESS
HAS BEEN KIDNAPPED

And you, Sir Knight, have the task of returning her to her father, the King, before nightfall, when SMAEGOR, the most foul, will certainly do her in.

Explore the unfamiliar lands beside the River Delta as you search for clues to SMAEGOR'S hiding place. Get the tools you will need: weapons, food, and magical items if you can find them. Prepare for encounters with the creatures of the land for some of them may be in league with The Dragon. Seek answers in the Land of the Dead, but enter cautiously for Ill awaits you there.

When, at last you are ready, confront the Mighty SMAEGOR in his lair, for M'lady awaits and is in much danger. CAN YOU DO IT? Can you vanquish SMAEGOR and beat the setting sun? Many surprises await you in this DRAGONQUEST—and one of them is named DEATH.

In a desperate race against the sun, you search for SMAEGOR, Monarch of Dragonfolk, who has kidnapped the princess of the Realm and holds her in a distant and unknown place. In a quest for Honor and glory, you must search the land, seeking out the tools needed for the ultimate confrontation. On the River Delta, in the abandoned Temple of Baathteski, Goddess of the Blade, everywhere clues abound. But WHERE is the Princess? Now, as never before, the genius of CHARLES FORSYTHE shines in this machine language ADVENTURE DRAGONQUEST. Can YOU save M'lady from the iron clutches of SMAEGOR? Tape version: Model I, Level II, 16K; Model III, 16K. Two individual disk versions available for Model I and Model III.
5006R (Tape) $15.95
5007RD (Disk, MODEL I) $21.95
5010R3D (Disk, MODEL III) $21.95

THE ELECTRONIC BREADBOARD

Computer Aided Design (CAD) is one of the newest applications of microcomputer technology. THE ELECTRONIC BREADBOARD permits the design and analysis of analog circuits. It can be used to evaluate voltages, currents, impedance and the frequency response of any circuit. This package is ideal for audio component repairmen, ham radio technicians, hobbyists, electrical engineers, telecommunications engineers, audiophiles and students of electronics. Tests can be made on any analog circuit such as transmitting and receiving equipment, amplifiers and the like. The program will allow: adding or removing components; calculating impedance at a particular point in the circuit; obtaining the voltage at a particular point (or all points); setting of the desired frequency or a sweep range of frequencies for analysis; and saving of circuit designs on cassette tape.

Components in a simulated circuit can be removed or inserted for fast, efficient design or analysis. The possible causes of circuit failure can easily be determined, reducing the amount of time spent on troubleshooting. In conjunction with a course in analog electronics, the program can be used as a training aid. Students can verify electrical theory by entering example circuits and determining frequency response. If you're an electronic doughboy, then you need THE ELECTRONIC BREADBOARD! Model I, Level II, 16K; Model III, 16K.
0287R (Tape) $49.95

NEW PRODUCTS AVAILABLE SOON for the TRS-80*

DOMES OF KILGARI

The Ion Station at Kilgari is rich in history and as far away from the civilized galaxy as you can get. Your Survey craft has been disabled, her Ion engines are dead for lack of fuel. Only by retrieving an Ion rod for the mass converter can you hope to leave the Outrim and return to Federation space. But the automated Digitron Ion Station is programmed to destroy all intruders. Can you solve the puzzle presented by this classic Adventure? Or will you be doomed to the lonely wasteland of Kilgari forever?

TIMEQUEST

Sifting through the sands of time, you attempt to solve the mystery as it unfolds before you. From the distant past to the obscure future your Time machine tracks Adventure in its truest form. High speed machine language with all the features you have grown to enjoy. Easily one of the best and destined to become a classic.

*TRS-80 is a trademark of Radio Shack, a division of Tandy Corp.

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Should a disk or cassette become defective after the warranty period, Instant Software will still protect you. You may return the original defective cassette along with $4.00, or any disk with $5.00 for a replacement. Again, you must provide us with a copy of your invoice for any return to be made.

On the Cover: sculpture entitled "The Undersecretary in Charge of Protocol" by Don Simpson, courtesy of the Earthlight Gallery, Boston.

Photo by Martin Paul

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Instant Software™ Inc. Peterborough, N.H. 03458 603-924-7296 **-A18**

Introduction

Wayne Green's anticipation of the growing demand for microcomputer software brought about his establishment of Instant Software back in early 1978. At that time, Instant Software consisted of a handful of employees, and produced six programs.

Today, Instant Software employs fifty five people and produces over one hundred software packages for the TRS-80, Apple, Pet, TI, and Northstar. We have over 200 more in the development stages, including programs for the TRS-80 Color, Atari and Casio computers. The rapid rate of development of microcomputer software by today's top-notch programmers pushes the industry's standards higher. For this reason, several months ago, we began an extensive review of each Instant Software product. The results . . . temporarily, a smaller product line, but a top-notch one.

Those packages which did not meet our standards are being rerun through our development pipeline. We are working closely with the authors to upgrade these packages, and make them available to you once again.

Speaking of upgrading . . . you'll want to keep your eyes on our new products, packaging and our advertising campaigns in the upcoming months. These all create an image in which we see . . .

Instant Software in your future.

Instant Software, Inc.

PMC-80 COMPATIBILITY

At this time, the following TRS-80 programs are known to be compatible with the PMC-80 computer:

0017R	Air Flight Simulation
0023R	Oil Tycoon
0058R	Programmer's Converter
0106R	Air Mail Pilot
0117R	Night Flight
0127R	Surveyor's Apprentice
0133R	Renum/Compress
0136R	Beginner's Russian
0137R	Everyday Russian
0140R	Business Analysis
0141R	Battleground
0159R	Jet Fighter Pilot
0168R	Label
0171R	Flight Path
0218R	Dr. Chips
0219R	House of 30 Gables
0223R	Cosmic Patrol
0228R	Dynamic Device Drivers
0230R	TLDIS
0232R	Disassembler
0240R	Alien Attack Force
0246R	Compression Utility Pack
0250R	IRV
5003R	Ultra-Mon

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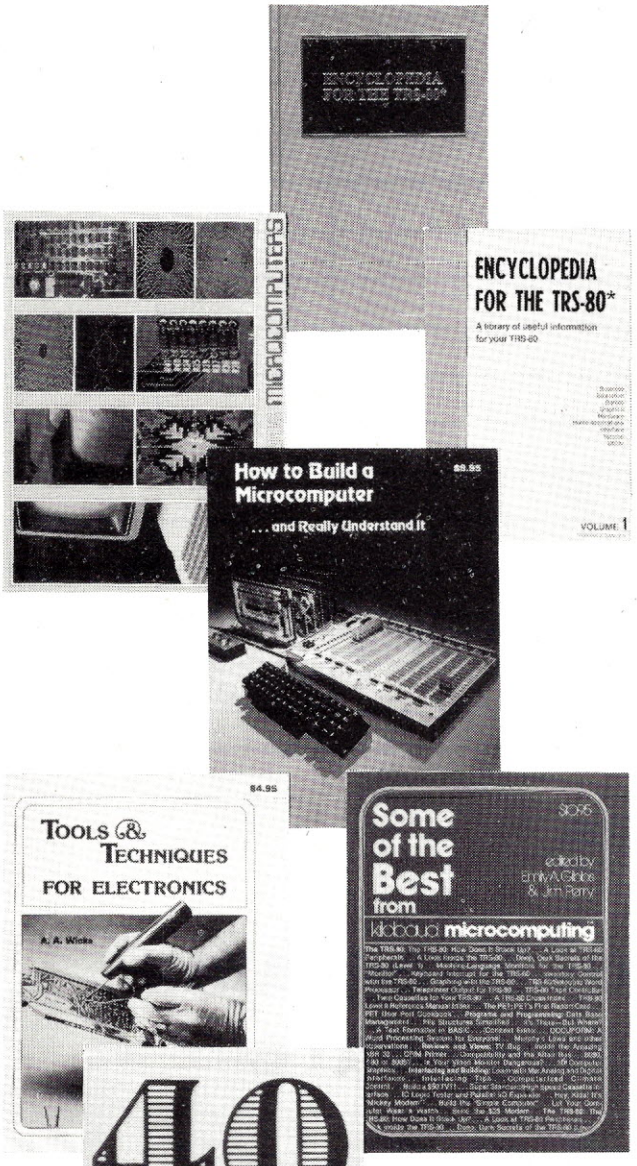

Encyclopedia for the TRS-80* is the newest peripheral for your microcomputer. This ten-volume reference series contains programs and articles especially selected to extend the documentation that comes with the TRS-80. Each volume contains business, education, games, graphics, hardware, home applications, interface, tutorial and utility selections. Volumes of the **Encyclopedia** will be issued one-at-a-time approximately six weeks apart. This means that each new volume will reflect the latest development in TRS-80 microcomputing. **Encyclopedia for the TRS-80** is available in two editions. The deluxe COLLECTOR'S EDITION has a handsome green and black hard cover with a dust jacket. A soft cover edition is also available.

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ATTENTION PROGRAMMERS

How to Submit Programs to Instant Software

The guiding idea behind Instant Software is a simple one. It takes time, talent, training and experience to write good programs; it also takes time, money, training, experience and talent to establish an efficient marketing system. You have the first set of qualifications; we have the second. We want to team up with you.

Instant Software is set up to evaluate submitted programs, to publish the best ones in quantity, and to market these programs through a network of computer stores and other retail outlets.

You have our catalog in your hands. Look at the breadth of the programs available: games, simulations, utilities, educational and business programs. While games have always been good sellers and are likely to remain so, bright futures for microcomputer software lie in the fields of business, educational and utility programs. Every business person wants to put his computer to work saving time and money. Good bookkeeping, accounting, inventory and billing programs are sure sellers. As microcomputers start to appear in schools, the need for good CAI programs will grow. Finally, programmers will continue to need the tools to write, edit and debug programs.

Thinking of programming for publication? If, in light of what is now being sold, your programs perform a unique function, work faster, are more convenient or easier to use, then we want to see them.

The kind of software we're soliciting consists of programs that not only solve old problems but also do jobs that couldn't be done before. We want software that incorporates the latest developments in the art of programming.

One piece of advice—write what you know. This advice applies especially to writers of computer software. If you're an accountant, you understand the problems faced by accountants. An accounting program authored by you has most likely addressed just those problems, and is probably a good one. The same goes for an educational program. A good teacher knows from training and experience precisely what students need in order to learn, and how to give it to them.

Please note: Instant Software is supporting all popular microcomputer systems. We want software for the TRS-80 Models I, II, III and the Color Computer, Apple II and III, Atari 800, PET, TI 99/4, Casio 2, and any other successful microcomputer system. At present the Instant Software lab, one of the best equipped computer laboratories in the world, has over 15 different computer systems running. What's more, we have the staff and the expertise to run and evaluate programs for all of these systems. We also seek conversions of successful programs from one system to another.

For the full details on program submission, write for a Submission Package to:

Submission Department
Instant Software, Inc.
Rt. 101 and Elm St.
Peterborough, NH 03458

In brief, the package will tell you that we need a complete description of what your program does, how it does it, how to use it and what benefits the user will get from the program. When you are ready, this information, plus a disk or cassette copy of your program, should be sent to the above address. We will send you a card of acknowledgement upon receipt of your material.

If we feel that your program has marketing potential, we'll send you a contract. Upon receipt of the signed contract, we'll send your program to up to five associate editors. We try to match the editor's background to the subject matter of the program. The associate editors will evaluate your program, tell us what they think of it, make suggestions for changes and suggest an estimated retail price. Our programmers will contact you about any changes.

Once the program has been completed, we'll write the user documentation, using materials you provide plus the experience of our trained documentation staff. Next, we design the package and write the package and catalog advertising. Then we print the documentation, make copies of the program on cassette or disk and release the package to our marketing department.

Our marketing department will set the price for the package, arrange the advertising campaign and coordinate the distribution of the package through our marketing representatives and Instant Software dealers.

Business/Applications for your TRS-80

FIND IT QUICK

Put an end to the misplaced information syndrome! Here is a reliable, fast, subject-oriented information locator—FIND IT QUICK! This information indexing and retrieval system is versatile and flexible—the ideal tool for doctors, lawyers, engineers, businessmen, educators, anyone who needs to locate information.

Designed with a journal/magazine format, FIQ is versatile enough to be used to store and retrieve any type of reference information including client lists, vendor advertisements, report bibliographies and more—even poems and famous quotations. Subjects can be indexed or called according to author, journal and date or by up to nine keywords that you determine. Keywords can be used singly or in combination during the search routines.

FIQ can be used by anyone. It requires no special skill, just the ability to type. Article references to be stored can be preselected and then entered into the system by a secretary or assistant. Even the contents of entire file cabinets can be indexed and stored!

FIND IT QUICK requires a minimum system consisting of TRS-80 Model I, Level II with 16K of RAM, an Expansion Interface and at least one disk drive. Up to 1080 items can be stored on one data disk. Instant Software's Tiny DOS operating system is included on the program disk so that you can use the program without fuss or bother.

Make your computer work like your own personal librarian with FIND IT QUICK. Can you afford to wait another day?

0258RD (Disk) $49.95

THE WORDSLINGER

At last . . . simplified letter writing! The Wordslinger is an economical program designed for the individual user or small business. The program has automatic formatting for letterhead stationery and envelope addressing. You can write and edit letters, reports, forms, even schoolwork! Text is stored on cassette tapes for fast, inexpensive retrieval. Once you've used the Wordslinger, you won't want to go back to your typewriter.

One of the Wordslinger's major advantages is that you don't need disk drives or an Expansion Interface. the minimum system required is the TRS-80 Model I, Level II with 16K of RAM and an appropriate printer (you may need an Expansion interface, if your printer can't operate with just a printer interface cable, such as Radio Shack's part #26-1411 or 26-1416).

0129R (Tape) $29.95

CLIMATE-COMP

Come rain or come shine, you'll love being "in the know" with Climate-Comp, our two-program weather package.

WEATHER FORECASTER—Gives you a short-range forecast of upcoming weather in your local area. Just enter past and present barometric pressure to obtain a "preview" of your weather for the next 24 hours.

WEATHER PLOT—Provides you with accurate, average weather data for most of the major cities of the United States. This program includes data files for the Continental U.S.

This is a chance for all amateur meteorologists to generate useful forecasts and weather data. Model I, Level II, 16K.

0316RD (Disk) $24.95

MAIL/FILE

from Galactic Software Ltd.
A Mailing List for the TRS-80
Model I or Model II

Instant Software always tries to provide you with the best software on the market. Although the Mail/File mailing list program is not published by us, it is so good that we want you to try it.

We have two versions of this mailing list. Pkg. 5000RD is for the Model I with the 5-inch disk drive and Pkg. 5001RD is for the Model II with the 8-inch disk drive. The programs are essentially identical except for the storage media and their respective capacities. With the 5-inch drive, you can store up to 600 names per disk without DOS, or 300 names per disk with DOS. With the 8-inch drive, you can store up to 2500 names per disk, with or without DOS. (If your list is larger than the single disk maximum, it can be distributed over several disks.)

The program maintains separate alphabetical and ZIP code files under constant sort. When you add a name to your list it will be inserted into its correct position in the files. You will never have to sort your list; it will always be ready to print labels.

The program will record your data in nine fields: two for NAME, and one each for ADDRESS, CITY, STATE, ZIP CODE, PHONE NUMBER, PHONE EXTENSION, and a five-character CODE field. When you print labels, you have a choice of three different label formats: a three-line label, a four-line label or a user-defined label. In the three-line and user-defined label formats, you may include a message line on your label.

The best feature of this program is the sort process that lets you determine which labels will be printed. You may specify either alphabetical or ZIP code order for all or any part of your list. For example, you can print labels for everyone on your list whose name begins with the letter A, or for all of those people who have the same ZIP code. You can even print labels for only those people named Jones, who are living in a given city or state. (Note: The Model II version can search for both first and last names, e.g., John Jones.) Furthermore, you can choose to print labels by using any single field (i.e., specific cities, states, phone numbers, etc.). You may assign specific codes to any name in the CODE field. For example, ACT could stand for active accounts, and INACT for inactive accounts. If you wanted to send a letter to all of your inactive accounts, you would specify the CODE INACT, and labels would be printed only for your inactive accounts. When you print labels, you may specify up to nine different CODES at one time. If your data matches any one of the CODES a label will be printed.

Files created with the Model I version of this program can be transferred to the Model II version, when you upgrade your hardware.

Package 5000RD requires the following minimum system:

1. A TRS-80 Model I, Level II with 16K RAM.
2. An Expansion Interface with 16K RAM (or more).
3. One (or more) mini-disk drives.
4. A compatible printer (80 or 132 columns).
5. TRSDOS Version 2.3.

5000RD Model I (Disk) $99.00
5001RD Model II (Disk) $199.00

BUSINESS ANALYSIS

(Formerly Oracle-80)

Business Analysis will provide you with analytical and forecasting capabilities previously available only in large computer and time-sharing systems. It is a flexible, professional time series package that can be used in sales analysis and forecasting, product planning, business planning, etc. The professional forecaster will recognize BUSINESS ANALYSIS as a tool which incorporates all the power of the X-11 model and extends it. Investors can analyze stocks, market trends and growth rates. Financial managers and economists can analyze the general economic climate and investigate business cycles. Even families can find this program useful in analyzing spending or energy consumption trends, for it is ideal for anyone who needs to analyze and forecast monthly, quarterly or annual data.

Even though this package uses advanced statistical methods, you don't have to understand higher math to use it. Designed to be used and understood by the typical business person, its powerful analytical capabilities will satisfy even the professional forecaster. All inputs and outputs are written in plain English and the documentation carefully explains all functions.

Adding, deleting and modifying data is accomplished with a very flexible editing routine. Automatic scaling of numbers, ability to choose from several output formats, a calendar format that identifies all your data by month/quarter/year, and the ability to add and subtract values while inputting from the keyboard provide added user flexibility. You can use several methods—moving average, rate of change, seasonal indices or cyclical indices—to analyze your data. The unique graphing capability lets you visualize your historic data or any of the modified data series you calculate, and direct any chart or graph to your printer.

Business Analysis will forecast future data values using trend, moving averages or seasonal methods. You may choose either constant unit-trend or a constant percentage-growth-trend forecast for even more flexibility.

This is one of the most powerful and useful business tools you will ever use. It puts the future in your hands.

The package requires the following minimum system:

1. A TRS-80 Level II with 16K RAM.
2. An Expansion Interface with 16K RAM.
3. One or more disk drives.
4. Any compatible Disk Operating System.
5. An optional line printer.

Note: Tape version *only* is Model III compatible.

0140R (Tape) $75.00
0152RD (Disk) $99.95

LABEL

Are you tired of trying to remember which line numbers of your program correspond to which routines in it?

Well, Instant Software has solved your problem! With the LABEL program in place, you can forget about such trivial things and rely on the names you have given the routines. You can use LABEL to keep track of these things for you and get down to serious programming.

LABEL allows you to use labels in place of line numbers in GOTOs, GOSUBs, IF . . . THENs, THEN . . . ELSEs, RESUMEs, ON ERRORs, ON X GOTOs, and ON X GOSUBs.

After you finish with your program, you can have it converted into a normal program (with line numbers in place of the labels in GOTOs, etc.) and execute it in computers without the LABEL program. With this conversion you have three options:

1. The labels are left at the beginning of the routines, but changed to line numbers in the program statements.
2. The labels at the beginning of the routines are changed to REM statements, and changed to line numbers in program statements.
3. The labels at the beginning of routines are deleted, and changed to line numbers when in program statements.

While you are using LABEL to write your program, you can have it list all the lines which have label identifiers (to either the video of the line-printer), you can search the program for the line number of a particular label, or you can use it to delete all the lines that begin with a REM.

LABEL is compatible with TRSDOS 2.1, 2.2, 2.3, and with NEWDOS and Percom MicroDOS. Model I, Level II, 16, 32 or 48K.

0168R (Tape) $24.95

ONE-D MAILING LIST

Here is a mailing list system that can be run on only one disk drive! You can have up to 17 fields of selection for name/address retrieval.

Disk versatility allows you to add, delete, or change the numerous details stored in the system.

Features of the One-D Mailing List include:

- *Automatic name sort (with zip code option).
- *Rapid access to any name on file.
- *Easy error correction and recovery.
- *Prints selective name listings.
- *Revise or update listings at any time.
- *Up to 2500 names on-line (with 4 drives).
- *Prints a list of all names on file.
- *Prints mailing labels.

This package requires the following minimum system:

1. A TRS-80 Model I, Level II with 16K RAM.
2. An Expansion Interface with 0 to 32K memory.
3. A single disk drive (with automatic upgrade for up to three additional disk drives).
4. Any compatible Disk Operating System.

0123RD (Disk) $24.95

USER'S TIPS

When writing BASIC programs, place the most often used routines at the front of the program. This will enable the program to run faster.

Utilities for your TRS-80

DYNAMIC DEVICE DRIVERS

Are you tired of working around all of the little "obstacles" that are built into your TRS-80? Ever wish that there was some way to "repair" those imperfections?

Well, here it is! The DYNAMIC DEVICE DRIVERS package has all of these features:

PROGRAMMABLE KEY DEBOUNCE—Your keyboard can be "tuned" to your typing style.

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LOWERCASE MODIFICATION SUPPORT—You have choice of standard or shift-for-lowercase letters. (A lowercase hardware modification must be installed.)

BETTER THAN NOTHING GRAPHICS—Graphics characters will be converted to the closest ASCII character.

PRINTER/SCREEN AUTO SWITCHING—If your printer is accidentally turned off, your program won't bomb.

PROGRAMMABLE PRINTER FORMS CONTROL—You control the format for printer output.

PROGRAMMABLE KEYBOARD LOCK—Only you will know the secret code to unlock your keyboard.

With the Dynamic Device Drivers package, you can look forward to working WITH your TRS-80, instead of against it! Model I, Level II, 16K.

0228R (Tape) $19.95
0199RD (Disk) $24.95

DISK EDITOR

Disk Editor is a powerful machine-language utility program that will allow you total access to ANY byte of information in ANY sector of ANY track of your disks. It is a fast, simple, and efficient method of modifying files—whether BASIC programs, SYSTEM programs, or just data. All commands are readily accessible, with no need to refer to a command table.

With Disk Editor you can examine, alter, add, and delete information with ease. Information can be retrieved from the disk by supplying track and sector information, or by giving the filespec. You can even search the disk for a specific string of characters (up to 8 characters long).

If you need hardcopy, use the LINEPRINT command to send a copy of the video display to your lineprinter.

You can transfer command from Disk Editor to Radio Shack's DEBUG and back, allowing dynamic debugging of disk I/O procedures.

Disk Editor is compatible with TRS-DOS 2.1, 2.2, and 2.3, as well as with Apparat's NEWDOS. It is even capable of reading disks made by Percom's Micro-DOS.

There are two versions of Disk Editor; one is for a 35-track DOS, and the other is for a 40-track DOS. Both are included in this package.

This package requires the following minimum system:

1. A TRS-80 Model I, Level II, 16K RAM.
2. An Expansion Interface.
3. A single Disk Drive.
4. Any compatible Disk Operating System.

(Disk Editor is not compatible with VTOS 3.0).

0180RD (Disk) $39.95

MASTER DIRECTORY

Wasn't it just yesterday you threw the cat into the washing machine because you were frustrated at not being able to find that Adventure that you saved on disk last week? Or, was it just yesterday that you force-fed that leftover hot tamale sauce to your mother-in-law because you had searched in vain for your backup copy of the Electric Pencil? And you say your three-year-old built a house of cards out of your carefully-filed business data disks and now you don't know which is which? Well, chin up, Bucky, 'cause MASTER DIRECTORY is here!!

The MASTER DIRECTORY is a disk file storage program that reads the files on all your disks, stores the file names and extensions, and even records the free space on each disk. All you have to do is number the disks in your library and the MASTER DIRECTORY will keep track of their contents. You can read the names, displayed alphabetically, search the DIRECTORY for file names and extensions, delete disks and search for free space. You can store 5000 files or 320 disks, whichever comes first.

Your disk storage problems are over now that the MASTER DIRECTORY is here. Model I, Level II, 16K RAM, Expansion Interface plus 1 disk drive.

5005RD (Disk) $29.95

DISK SCOPE

Need to check out a disk? Perhaps you want to see how the files are stored, or you forgot your password. No problem! Now you've got Disk Scope!

If you know the name of the file, the Fileloc program will show you what tracks and sectors on the disk contain that file, as well as how much memory the file takes when loaded into RAM. This works for both program and data files. Fileloc then allows you to print the information, restart the program or exit to BASIC. The information obtained allows you to use the CDISK program effectively.

CDISK is a powerful little BASIC utility and test program. It will allow you to view any track and sector on your disks in ASCII, Hex and screen POKEs. It totally disregards protection codes. It can also be used to randomly check all 350 sectors of your disk for read errors.

You don't know the whole file name if you haven't got the password, so the PASSWORD program has been included in the Disk Scope package. This machine-language utility not only gives you a password for files, but for the whole disks as well. Whether you're a novice or a pro, if you use a disk system, you need Disk Scope.

This package requires the following minimum system:

1. A TRS-80 Model I, Level II, 16K RAM.
2. An Expansion Interface.
3. A single disk drive.
4. Any compatible Disk Operating System.

0139RD (Disk) $19.95

TLDIS & DLDIS

You've bought a super machine-code program, but now wonder how it works. Maybe you even used a quick PEEK routine to glance through it when it was in memory. If so, you definitely noticed the complete lack of comments in the code, making it almost impossible for you to decipher and understand it.

Well, Instant Software's Labeling Disassemblers are the answer to your problem.

TLDIS (Tape-based Labeling DISassembler) and DLDIS (Disk-based Labeling DISassembler) make three passes to assign labels (where appropriate) to the routines in a machine-language program. Their output is almost identical to that of a hand-assembled source code.

You can send the disassembly to a lineprinter (Radio Shack parallel port) for either TLDIS or DLDIS. (The difference between these utilities is the storage mode of the disassembly.)

TLDIS can send the disassembly to cassette tape, DLDIS can send it to disk; both send it to the video monitor. The stored disassembly from TLDIS may be reassembled with Radio Shack's EDTASM™—the disassembly from DLDIS, with Apparat's extension of EDTASM™. Because of the use of labels, it is a simple matter to change any object code program by disassembling it and then making changes to the resultant source code, without losing track of jump/load addresses. Labels start with "AA00" and increment up, in even numbered steps (AA02, AA04, etc.). The odd numbers (AA01, AA03, etc.) are left for you to use for the source code during reassembly.

The printing of the disassembly may be temporarily halted by using ((SHIFT)) @ (just as in BASIC) or it may be ended by pressing the ((BREAK)) key. It also has a comments column to display ASCII characters used in a LD or CP opcode.

TLDIS and DLDIS may be relocated in memory to avoid conflict with the program you disassemble.

The next time you need to "climb inside" a machine-code program, take DLDIS or TLDIS with you. We promise that it will be an easier journey. Model I, Level II, 16K; Model III, 16K.

0230R (TLDIS-Tape) $14.95
0231RD (DLDIS-Disk) $19.95

RENUM/COMPRESS

Add a new command to your TRS-80! RENUM/COMPRESS fits in the top 767 bytes of memory and you call it like any BASIC command.

You forgot an INKEY$ routine and there's no space for a new line number? The command allows you to renumber your BASIC program. You can set the new starting line number and the increment or (like any good command) it will default automatically to standard values.

You think memory is going to be tight? This command allows you to compress the program instantly by removing REM statements and any spaces outside of quotes!

If you're a BASIC programmer, this is the one utility you should have loaded and ready to go! Add the command: RENUM/COMPRESS! Note: Not disk compatible. Model I, Level II, 16K.

0133R (Tape) $14.95

IRV

IRV, one of the most powerful utility programs available, turns your keyboard into a SUPERKEYBOARD.

Now you can have single key programming. IRV comes complete with its own keyboard definitions, or up to 255 characters can be assigned to every key, including (ENTER) and (BREAK). You can enter often-used BASIC words, variable names or even entire lines. Even functions, such as RUN, LIST, or EDIT can be entered with a single keystroke.

The relocate feature of IRV is unique, in that it allows single line relocation and renumbering. You can merge lines using the EDIT function and a single keystroke.

As a video editor, IRV is so powerful, you'll wonder how you got along without it. Full cursor control, blinking cursor, block movement and special erase functions are just the beginning. Frequently used video graphics blocks can be saved and used again and again. Even IRV's minor virtues are impressive. You can have auto repeat with any key, including programmed functions. You won't have to pull plugs or fiddle with a control box to rewind or fast-forward a tape. The cassette recorder can be controlled from the keyboard.

If you are a creative programmer (or wish to be), you need the power and convenience of IRV! Tape version, Model I, Level II, 16K. Disk version, Model I, Level II, 16K, Expansion Interface plus two disk drives.

0250R (Tape) $24.95
0350RD (Disk) $29.95

COMPRESSION UTILITY PACK

Do you want to add sound routines to a Space Trek program that already uses 16K? Or maybe you need an extra column in that financial report program, but when you run it, you get OM errors?

With a wave of your hand, and a little help from either of the COMPRESSION programs in this package, your problems are over.

COMPRESS-80—Fits in 265 bytes, deletes spaces, and offers the choice of leaving REMark line numbers in the program, or deleting them altogether.

SUPERCOMPRESS—Uses 767 bytes and can do everything COMPRESS-80 can do PLUS, it packs the program into the smallest possible number of multiple statement lines.

With the Compression Utility Pack and your own programming skill, you can add all those little extras to your BASIC programs. Model I, Level II, 16K.

0246R (Tape) $19.95

THE DISASSEMBLER

This is a single-pass, hex-notation disassembler that will send its output either to tape or to a lineprinter (Radio Shack parallel port). The tape output is directly compatible with Tandy's EDTASM™. Thus, you can take an object code tape, disassemble and output it to tape, then use EDTASM™ to add, delete, change and even re-assemble your new version.

In addition, it shows the displacement and absolute address of any relative jumps made by the disassembled program. It also displays any ASCII characters used in an LD or CP opcode.

Since the Disassembler works only on in-memory programs, it has been made relocatable so that you may move it around in memory to avoid conflict with the program you wish to disassemble. As an added option, you may also jump to memory locations and transfer control between Disassembler and other utility programs in your computer.

The Disassembler—use it to examine and analyze any resident machine-code program! Model I, Level II, 16K; Model III, 16K.

0232R (Tape) $9.95

Education for your TRS-80

PROGRAMMER'S PRIMER

Sometimes thousands of words can't give a clear picture of complicated theories and concepts. There are times when a chart or picture is worth those kilo-words, and more! The novice computer programmer is offered this breath of fresh air in an otherwise stuffy situation—the PROGRAMMER'S PRIMER.

This program functions as a Computer Aided Instruction package to introduce the novice programmer to several important computer concepts. It graphically explains the relationship of decimals to hexadecimals in the Decimal:Hexadecimal Conversion routines. Data storage is explained with the Subscription of a Variable and Three Dimensional Array routines. The logic of program flow is shown in the For-Next Loops flow chart demonstration. Finally, the Bubble Sort sorting technique is shown, in a fascinating display of what a computer does best.

Don't be a "scratch your head in wonder" boy any longer. Let the PROGRAMMER'S PRIMER package from Instant Software help you on your way down the primrose path of programming! Model I, Level II, 16K; Model III, 16K.

0245R (Tape) $9.95

PROGRAMMER'S CONVERTER

This package contains three programs that can aid you in converting to other number-base systems.

BASE CALCULATOR—Turn your TRS-80 into a calculator. Convert numbers to any base from 2 through 16 and perform calculations in that base. Memory, sign change, one's and two's complement are all available. It will even handle fractions.

HEXADECIMAL/DECIMAL CONVERSION TRAINING—A dual-purpose program. First, it's a handy converter that changes decimal numbers to hexadecimal notation (and vice versa). Second, it's a teaching/testing program that gives you practice in making those conversions yourself.

NUMBER BASE CONVERSIONS—Converts any decimal, binary, octal, or hexadecimal number (up to $FFFF), to its equivalent value in the other three bases and displays all four values simultaneously.

You'll have a command of octal and hex notation—instantly! Model I, Level II, 16K; Model III, 16K.

0058R (Tape) $9.95

ULTRA-MON

ULTRA-MON is a unique and powerful machine-language monitor. It is ROM independent and will function in Level II or DOS BASIC. With ULTRA-MON, you will be able to write, modify, study and debug machine-language programs. Plus, you'll be able to avoid the frustration and "bomb-outs" usually associated with machine-language programming. ULTRA-MON displays, disassembles, traces (hardcopy trace disassembly, too!), modifies, relocates memory, prints and even relocates itself with simple commands. Using interpretive execution, ULTRA-MON allows you to put breakpoints in ROM. This powerful monitor can even fetch, decode, disassemble and analyze each instruction individually so that your program cannot bomb out.

ULTRA-MON is designed for the beginning machine-language programmer as well as the professional. The documentation contains a Simple Demonstration section geared to the novice. Consequently, the program is a learning device as well as an extremely useful programming tool.

If you are serious about programming, you need to add this powerful utility to your library today. Model I, Level II, 16K.

5003R (Tape) $24.95

TEACHER'S AIDE

Now you can have the benefits of Computer Assisted Instruction (CAI) in your own home. The Teacher's Aide program will let you create a teaching system for any conceivable subject. The program allows you to create a question and answer lesson (you can input up to 8000 characters per lesson). You can then save this lesson on the disk and create an entire sequence of lessons.

Your lessons can be tailor-made for you or your students. The options available are: (1) Review the material prior to taking the lesson, (2) provide hints to help answer questions, and (3) offer a graphics display as a reward for correctly answering all the questions. The Teacher's Aide program will even allow for spelling errors!

Teacher's Aide is perfect for parents, teachers, and students who need the unlimited patience and undivided attention that only a computer can provide. Readin', Ritin', and 'Rithmetic will never be the same—now that you have the Teacher's Aide package from Instant Software, Model I, Level II, 16K, Expansion Interface + one disk drive. Recommended for teachers and parents.

0214RD (Disk) $39.95

RECENTLY REVISED—
NOW BETTER
THAN EVER!!!

TYPING TEACHER

A complete seven-part package that guides you from familiarization of the keyboard through typing words and phrases to mastery of touch-typing. Your video monitor becomes a bottomless page for typing practice, and your own private TYPING TEACHER, ready to teach when you're ready to learn. Model I, Level II, 16K; Model III, 16K.

0099R (Tape) $12.95

GEOGRAPHY EXPLORER: USA

The Geography Explorer: USA package is the most fascinating (and least painful) way of learning social studies that we've seen yet.

The program displays computer-generated maps of the United States, its seven regions, and its individual states. The student then answers questions about the states of a given region. These questions may be in Multiple Choice, Recognition or Fill-in format.

You can learn each state's name, capital, largest city, nickname, population, population rank, population density and percentage in urban areas, the state's flower, bird, tree, song and motto! Furthermore, Geography Explorer has a unique TEACHER mode which allows the teacher or parent to choose multiple options of how the material is to be presented. This permits directed learning for the student.

The package is also just plain fun! When the student answers the questions correctly, there are a variety of graphic rewards that flash on the screen to provide immediate, positive reinforcement.

As a bonus, this educational package can use a compatible Light Pen! The Light Pen can be used to respond to the MENU or to answer multiple-choice questions; simply point to the flashing square of your choice. (If you do not have a Light Pen, or you prefer not to use it, all responses can be entered from the keyboard.)

The union of sophisticated software with the speed and novelty of the Light Pen represents a milestone in Computer Assisted Instruction. As advanced as this package is, it can be readily used by grade-school students. Truly, it is educational software for any age.

We think you'll be equally impressed once you've explored these United States with the Geography Explorer. Model I, Level II, 16K, Expansion Interface + one disk drive. Light pen optional. Recommended age level six to adult

0071RD (Disk) $49.95

SURVEYOR'S APPRENTICE

This program makes applied math fun! Actually, we use the concept of area every day. You buy land by the acre, rent office space by the foot, and buy advertising space by the column-inch. The Surveyor's Apprentice can teach you the formula used to find the area of any plane figure.

Programs cover rectangles, circles, triangles, parallelograms (including both rhomboids and rhombuses) trapezoids, and polygons. This three-part package displays on-screen diagrams of all the figures, gives the formula for the area of each figure, and even gives you examples of computations. You can even request a quiz to see how well you're doing.

Here's an excellent refresher course for people who use calculations in their work. Why not broaden your area of expertise with the Surveyor's Apprentice! Model I, Level II, 16K; Model III, 16K. Recommended age level Jr. High to adult.

0127R (Tape) $9.95

BEGINNER'S RUSSIAN

In order to understand a foreign culture, you must know its language. In today's international politics and commerce, one of the most valuable languages to know is Russian. The Beginner's Russian package can put you well on the road to learning this vital language.

The three programs in this package will give you on-screen displays of the Cyrillic letters, detailed instructions on their proper pronunciation, and exercises that will have you recognizing and speaking simple Russian words.

This package is ideal for students, businessmen, scientists—perfect for anyone who is interested in learning the Russian language. Model I, Level II, 16K; Model III, 16K. Recommended age level 10 to adult.

0136R (Tape) $9.95

EVERYDAY RUSSIAN

This package is the second in Instant Software's Russian language series. Everyday Russian will acquaint you with the words for various foods, places to eat, signs, and the names of stores—exactly what a traveller needs to know. You'll also learn the order of the Cyrillic alphabet.

Each of the three parts in this package will not only teach you the words but will also present you with a quiz as well. Just pick the words you want to work on. The computer will score how well you've learned your lesson.

You can even practice typing in Russian. The program will allow you to type in the letters, or words, using the complete Cyrillic alphabet. Practice writing words such as hotel names, tourist attractions, and street addresses.

Why be deaf and mute when faced with the richness of the Russian language? Discover it for yourself with the Everyday Russian package. Model I, Level II, 16K; Model III, 16K. Recommended age level 10 to adult.

0137R (Tape) $9.95

RUSSIAN DISK

Beginner's Russian and Everyday Russian are available together on disk. Model I, Level II, 16K, Expansion Interface + one disk drive; Model III, 16K.

0212RD (Disk) $24.95

ULTRA-MON AND MODEL III

Ultra-Mon is compatible with the Model III computer with this short lineprint patch. Enter the listed code at the designated address. The program must be located at its original loading address, 6E00.

7BBE	E5	PUSH HL	;SAVE HL
7BBF	F5	PUSH AF	;SAVE AF
7BC0	DB FB	IN A, (0F8H)	;GET PRINTER STATUS
7BC2	CB 6F	BIT 5,A	;PRINTER SELECTED?
7BC4	28 04	JR Z, 7BCAH	;SKIP IF NOT
7BC6	CB 7F	BIT 7,A	;PRINTER BUSY?
7BC8	20 F6	JR NZ, 7BC0H	;LOOP IF IT IS
7BCA	F1	POP AF	;GET AF
7BCB	D3 F8	OUT (0F8H),A	;SEND A TO PRINTER
7BCD	E1	POP HL	;RESTORE HL
7BCE	C9	RET	;RETURN
7BCF	00	NOP	
7BD0	00	NOP	

To enter the program from Ultra-Mon's register display mode, type the following sequence (s denotes space bar): MM7BBE s E5 s F5 s DB s F8 s CB s 6F s 28 s 04 s CB s 7F s 20 s F6 s F1 s D3 s F8 s E1 s C9 s 00 s 00 (enter).

Your printer will now operate normally. Please note that this patch does not check to see if there is paper in the printer.

In addition, the documentation describes 6CC as the way to go to basic. Model III basic is more effectively entered from location 1A19. Where the documentation suggests the command E6CC,418E (enter), you should type E1A19,418E.

Games, Simulations and Entertainment for your TRS-80

AIR FLIGHT SIMULATION

Air Fright might be more like it! Instrument takeoffs and landings are no picnic—ask any pilot—and this computer simulation is certain to keep you on the edge of your seat.

You'll feel the adrenalin flowing, which accounts for the great popularity of flight simulation. Here's a program that provides a real sense of accomplishment, as you progress from takeoffs to tailspins and from landings to loops.

You begin with a full tank of gas and a flight plan that calls for a simple takeoff and landing—at least until you get the hang of it. Pay close attention to your instrument panel, especially the angle of ascent/bank indicator and air speed indicator—too steep a bank and your air speed will drop like a stone and so will your plane.

It's about as close to the real thing as you can get this side of a runway; and once you get some flight time under your belt, the sky's the limit. You can use the program to fly a course against a map—even try your hand at acrobatic maneuvers! Fun for the whole family. Model I, Level I; Model I, Level II, 16K; Model III, 16K.

0017R (Tape) $9.95

ALIEN ATTACK FORCE

(Formerly Invaders)

The invaders are coming! Earth's defenses are dead except for your Laser base. Your assignment is to destroy the approaching ALIEN ATTACK FORCE before it destroys Earth. Before Earth's sensors failed, they detected 550 armed invaders in space, speeding toward us in 10 attack formations of 55 in each group. The sensors detected four different types of attack craft: Large, Medium, Small, and a short profile craft which is the most difficult to destroy. If you cannot stop these space attackers they will stop Earth . . . for good. Model I, Level II, 16K; Model III, 16K.

0240R (Tape) $9.95

BALL TURRET GUNNER WITH SOUND

For years the Petro Resource Conglomerate has attacked our photon collection stations and strangled our deep-space trade routes. The PRC Exxonerator Class light fighters (code name: Gnat) have been their main weapon. Now you can strike back, by joining the Ball Turret Gunner Service.

Imagine yourself at the control console of an LW-1417 Stratoblazer (Type B Strategic Laser Weapon). Your Hindsight Director informs you that a Gnat fighter is coming in for an attack. You pivot your gigawatt laser turret until you can see the target on your monitor. The Range Indicator shows him coming in fast. The Targeting Computer studies his course and speed as your finger tenses over the firing key. You know you'll have only a fraction of a second in which to react. The Gnat fighter's evasive maneuvers cause him to dance in your sights. Suddenly, you see the FIRE command and you react instinctively. Your laser beam lashes out and reduces the Gnat to an expanding ball of ionized gas. Mission accomplished!

Ball Turret Gunner, with your choice of multiple levels of difficulty, optional sound effects and superb graphics, is more than just a game. It's an adventure. Experience it! Model I, Level II, 16K.

0051R (Tape) $9.95

JET FIGHTER PILOT

The Jet Fighter Pilot package takes you as close to real combat flying as possible . . . without pulling G's.

In this brilliantly realistic simulation, you become the pilot of a high performance, twin turbo-jet fighter. Total control of the aircraft is yours.

At the start of your mission, you'll go through an entire engine start procedure before your flight (provided your ground maintenance is up to par). Your takeoff will be from either the deck of an aircraft carrier (via a steam catapult) or from an airfield.

All controls respond the same as they would on a real jet fighter. You'll have to constantly monitor your display and make adjustments to your throttle, flaps, rudder and air spoilers. You decide when to retract flaps, landing gear and release the auxiliary fuel drop-tanks.

Your on-board navigational computer will direct you to your selected airport. The Glideslope/Localizer information will aid you in approaching and landing on an aircraft carrier deck or airfield.

The Weapons Control Computer will arm your missiles, provide you with the range and bearing to a target, and tell you when to attack. And, if things should get a little too hot, you have an ejection seat command for egress.

For a carrier-based landing, you'll have to deploy your tail hook. For a land-based landing, you'll need reverse thrust and to deploy your drag 'chute.

After you've flown a few missions with the Jet Fighter Pilot package, you'll know you've earned your wings. Model I, Level II, 16K; Model III, 16K.

0159R (Tape) $14.95

SWAMP WAR

Your (formerly) trusty ship, The Stellar Spaniel, has lumbered its last lightyear. An unfortunate encounter with a neutron star has damaged your hyperspace drive. you are stranded on a water-covered planet. Fortunately, you have managed to make it to one of the nine adjacent islands that compose this world's only dry land.

On each island, you discover the remains of an earlier landing party. Apparently, they were wiped out before they could finish building their supply transporters. A brief inspection reveals that each may safely transport you as far as one of the other islands.

There is evidence of all sorts of reptilian life—some small, some not so small, and some INTELLIGENT! You have an uneasy feeling that your sojourn here may not be entirely without incident . . . This feeling is transformed to terror when you find yourself suddenly surrounded by sapient swamp creatures shooting at you.

Your only hope is to use your maintenance 'droids to collect all the transporters and to clear the islands of the swamp creatures. Duck, dodge, shoot back . . . do what you must—but survive the Swamp War!!

The Swamp War program includes variable levels of difficulty, automatic scorekeeping and fast-paced graphics with optional sound effects. Model I, Level II, 16K; Model III, 16K.

0312R (Tape) $14.95

DANGER IN ORBIT

(Formerly Asteroid)

DATE: 28.02.2047

LOCATION: 270 million miles from Terra

MISSION: Maintaining Terra's Space Lanes

Briefing will follow:

1.1 Your mission is to destroy any asteroids in your sector and to prevent alien spacecraft from infiltrating the Terran Defense Network.

1.2 Your ship is armed with an anti-matter cannon. You can shoot large asteroids, but this turns them into many smaller asteroids, each capable of destroying your ship.

1.3 In addition, alien ships can make instantaneous hyperspace jumps into your area and start firing on your ship.

1.4 You'll need lightning reflexes and nerves of steel to survive DANGER IN ORBIT. We have no use for non-survivors!

DANGER IN ORBIT, a real-time, machine-language game, features variable levels of difficulty, superb high-speed graphics, sound effects and automatic scorekeeping. Tape version: Model I, Level II, 16K; Model III, 16K. Disk version: Model I, Level II, 16K, Expansion Interface + one disk drive.

0237R (Tape) $14.95

0247RD (Disk) $19.95

AIRMAIL PILOT

Picture the Pony Express with wings—that's Airmail Pilot! In place of hostile tribes and highwaymen, the pioneers of the airmail routes faced other dangers. They fought treacherous winds and thermals, sudden storms, and a constant battle with time. All of this to prove early airmail service was dependable and worthwhile.

Here's a program that lets you go back in time to the early days of aviation. You must fly the mail from Columbus to Chicago. Your Jenny, a cloth-covered biplane, must take you through unpredictable winds and electrical storms. The on-board clock will time your flight. You must get the mail through in the shortest time possible.

It's more than a game. You become totally involved in your mission. Not only is your reputation as pilot at stake, the future of Airmail—the bold new arm of the postal service—rides with you. Model I, Level II, 16K; Model III, 16K.

0106R (Tape) $9.95

DR. CHIPS

When the problems of your world begin to pile up, you can now turn to your own livingroom "psychiatrist"—DR. CHIPS.

The good Doctor is there whenever you need him for as long as you need him. He may not solve any of your problems but we're sure you'll be amused at his responses.

Why shoulder the burdens of modern life in silence? Put your TRS-80 and DR. CHIPS to work today and get it all off your chest! Model I, Level II, 16K; Model III, 16K.

0218R (Tape) $9.95

FLIGHT PATH

Experience all aspects of modern aviation with FLIGHT PATH.

MOUNTAIN PILOT—Transforms you into a daring bush pilot as you fly badly needed supplies to a remote gold mining camp. You must cross a hazardous mountain range, while struggling with headwinds, tricky navigation and diminishing fuel.

Watch your airspeed, altitude and rate-of-climb or you could stall and crash. If you deliver your supplies, you must then return over those mountains with a heavy cargo of gold bullion.

O'HARE—A control tower simulation in which you become an Air Traffic Controller. You are responsible for hundreds of human lives, as you guide the aircraft through your control sector to a safe landing.

You'll have to deal with different aircraft requirements, wind change warnings and potential midair collisions. But no matter what happens, you must bring in each of the 20 aircraft in your tour of duty.

PRECISION APPROACH RADAR—Combines the skills of pilot and Air Traffic Controller. You become the pilots' "eyes" as they try to land in limited visibility conditions. Your commands guide the aircraft in its approach to the field and a safe landing.

The flight path package involves you in both sides of flight procedure, from the thrill of flying to the tense drama of air traffic control. Model I, Level II, 16K; Model III, 16K.

0171R (Tape) $9.95

THE FLYING CIRCUS

The Flying Circus package covers the full range of flying from old time biplanes to modern day air traffic control. These seven programs offer you the daring realism of flight:

AIR FLIGHT SIMULATION—Allows you to learn and practice the essentials of piloting.

NIGHT FLIGHT—A nighttime photo reconnaissance mission.

AIRMAIL PILOT—Return to the early days of aviation, where it's just you and your aircraft against the elements.

MOUNTAIN PILOT—Fly to a remote mining camp with desperately needed supplies.

O'HARE—Transforms you into an air traffic controller.

PRECISION APPROACH RADAR—Requires the skills of both an air traffic controller and a pilot.

JET FIGHTER PILOT—Takes you as close to real combat flying as possible . . . without pulling G's. You become the pilot of a twin turbo-jet, supersonic fighter. Total control of the aircraft is yours from takeoffs to landings to launching your missiles and destroying the target.

Your dream of flying becomes a reality with The Flying Circus package. Model I, Level II, 16K, Expansion Interface 16K & one disk drive.

0205RD (Disk) $39.95

HOUSE OF THIRTY GABLES

Gold and treasures tempt us all, but only the stout of heart and swift of mind should attempt a trek through the legendary House of Thirty Gables. To be alert is to be successful against the strange array of creatures (and other terrors) waiting to end your quest for riches. Serpents and trolls are merely minor obstacles in this dungeon of mystery.

You make your way through these dank halls by typing two-word commands, such as GO WEST, READ SIGN, THROW AX, etc. You'll find various objects along your way—some of which you may need in order to solve the problems endemic to this enigmatic residence.

Lest you forget, there are heaps of treasure to be had for the adventurous and crafty explorer. However, the real reward is the pleasure you will have by outwitting the sinister inhabitants of the HOUSE OF THIRTY GABLES! Model I, Level II, 16K.

0219R (Tape) $9.95

COSMIC PATROL

Skilled players soon master many difficult computer games, but COSMIC PATROL is in a world all its own. The challenge intensifies! Supporting graphics and sound (optional) make each encounter an exciting new experience. It all adds up to a Super 3-S package. . . Skill, Sight and Sound.

Scenario: The COSMIC PATROL program puts you in the command chair of a small interstellar patrol craft. Your mission is to defend Terran space and prey on the Quelon supply ships which carry essential parts and lubricants for that implacably hostile robotic force. The drone freighters are fairly easy pickings for the accomplished starship pilot, but beware of the I-Fighter escorts. They're armed, fast and piloted by intelligent robots linked to battle computers. They never miss.

The Cosmic Patrol program is not just another search and destroy game. With its fast, real-time action, impressive sound option and superb graphics, this machine-language program is the best of its genre.

Don't keep putting quarter after quarter into arcade games or spending big bucks for video game cartridges. Get COSMIC PATROL from Instant Software—and get the best for less! Tape version Model I, Level II, 16K; Model III, 16K. Disk version Model I, Level II, 16K.

0223R (Tape) $14.95
0224RD (Disk) $19.95

BATTLEGROUND

Here is a program that should interest you war-gamers:

It is late 1944, and the Allied Forces are sweeping toward Berlin. As General of your sector, you have at your command tanks, planes, artillery, infantry, engineers and vehicles—an awesome array of fighting men and the machines of war. From intelligence reports you know that the enemy General is a shrewd tactician, not to be underestimated. It will take planning and strategy to outwit this wily old campaigner.

The battle map of your sector will fill with markers, each showing the deployment of your forces. You and another player will slip into the roles of opposing German and American commanders as yet another battle unfolds. Battleground allows you to experience the total responsibility of a battle-area command. It will be up to you to deploy your forces. On your shoulders rests the decision whether to call for direct artillery gunfire or to order your planes into the air. You will constantly be watching for an enemy airdrop, always carefully maneuvering your Forces.

The stark reality of World War II comes alive in BATTLEGROUND. Model I, Level II, 16K; Model III, 16K.

0141R (Tape) $9.95

NIGHT FLIGHT

Participate in one of the pivotal events of World War II—an awesome responsibility for you! Ready to tackle it?

It's May, 1941, the dreaded Axis battleship, the Bismarck, has broken out of the North Sea and is now somewhere in the North Atlantic. Your mission: make a nighttime photo reconnaissance flight over the Bismarck. You can help the Admiralty determine the extent of damage suffered by the Bismarck in a previous battle and whether the British fleet has a chance of sinking the German pocket battleship.

The Night Flight program lets you take off, fly and land a propeller-driven aircraft. Practice approaches and landings with a full on-screen display of the landing field information. The program will practically teach you to fly.

Somewhere out in the cold, gray North Atlantic, the Bismarck tries to elude her pursuers. Your photos are vital. Launch yourself into the night sky with the Night Flight package. Model I, Level II, 16K; Model III, 16K.

0117R (Tape) $9.95

THE ALL STARS

Here's a collection of our best selling games. . . the ones you'll want to play again and again. It includes: SANTA PARAVIA AND FIUMACCIO—Become the ruler of a medieval city state as you struggle to create a kingdom. Up to six players can compete to see who will become the King or Queen.

OIL TYCOON—Avoid oil spills, blowouts and dry wells as you battle to become the world's richest oil tycoon. Two players become the owners of competing oil companies. . . and there's room for only ONE at the top!

PARADISE TRADER—You're the captain of a trading schooner, sailing the Caribbean in search of profits. As you sail from island to island, beware the dangers of the deep: pirates, ghost ships and hurricanes. Good sailing, skipper!

MILLIONAIRE—Here's $1000. Can you turn it into a million dollars in fifteen (simulated) years? It depends on your strategy as you buy and sell properties, negotiate bank loans, collect rentals and accept sealed bids.

TIMBER BARON—An in-depth experience of the timber business, from dropping trees, until the milled lumber reaches the market. Your transactions are affected by those unexpected eventualities that can upset even the most careful plans.

BATTLEGROUND—European Theater, 1944: Your forces are sweeping toward Berlin. At your command are tanks, planes, artillery, infantry, engineers and vehicles. The battle map will fill with markers showing the development of your forces and the location of the enemy in one day of fighting. This two-player game will provide hours of entertainment. Model I, Level II, 16K, Expansion Interface + one disk drive.

0213RD (Disk) $34.95

SANTA PARAVIA AND FIUMACCIO

Buon giorno, Signore!

Welcome to the province of Santa Paravia. As your steward, I hope you will enjoy your reign here. I feel sure that you will find it, shall we say, profitable.

Perhaps I should acquaint you with our little domain. It is not a wealthy area, Signore, but riches and glory are possible for one who is aware of political realities. These realities include your serfs. They constantly request more food from your grain reserves, grain that could instead be sold for gold florins. And should your justice become a trifle harsh, they will flee to other lands.

Yet another concern is the weather. If it is good, so is the harvest. But the rats may eat much of our surplus and we have had years of drought when famine threatened our population.

Certainly, the administration of a growing city-state will require tax revenues. And where better to gather such funds than the local marketplaces and mills? You may find it necessary to increase customs duties or tax the incomes of the merchants and nobles. Whatever you do, there will be far-reaching consequences. . . and, perhaps, an elevation of your noble title.

Your standing will surely be enhanced by building a new palace or a magnificent *cattedrale*. You will do well to increase your landholdings, if you also equip a few units of soldiers. There is, alas, no small need for soldiery here, for the unscrupulous Baron Peppone may invade you at any time.

To measure your progress, the official cartographer will draw you a *mappa*. From it, you can see how much land you hold, how much of it is under the plow and how adequate your defenses are. We are unique, in that here, the map IS the territory.

I trust that I have been of help, Signore. I look forward to the day when I may address you as His Royal Highness, King of Santa Paravia. Buona fortuna—or, as you say, "Good luck".

For Model I, Level II, 16K.

0043R (tape) $9.95

PERFECT PONG

The last bastion of propriety has been breached. You, the staid, serious TRS-80 user are about to enter a world where no person can resist the lure, the excitement, the frenzy of the Arcade. Yes, you are about to meet—PERFECT PONG!

Instant Software presents Perfect Pong to add some zip and zest to your computer life. Enough of those math, bill paying and utility programs. It's time to add some fun to your life!

Perfect Pong is two programs offering nine different game boards and sound. Written in machine language, they are both fast and tricky. You control the paddles—but can you control your emotions in the middle of a rousing contest?

Why perpetuate the "stuffed shirt" image? Unleash the force of Perfect Pong and your computer will never by the same. Model I, Level II, 16K; Model III 16K.

0120R (Tape) $14.95

OIL TYCOON

What would it be like to be one of the world's biggest oil producers? You and your friends can find out with this action-packed simulation as you compete to become one of the oil industry's wealthiest tycoons.

Beginning with $2 million, and armed with information from geologists' reports, you'll explore for new wells, exploit existing wells, and invest heavily in research and development in an effort to make your oil the most competitive available.

Once you have oil to sell, you can name your price—but don't get too greedy, or you'll find the demand for your product dwindling till the prices become more attractive.

The game involves elements of both strategy and chance. Whether you wind up as one of the world's wealthiest men, or the bankrupt victim of too many oil spills, blowouts, and dry wells, you're sure to find Oil Tycoon both challenging and exciting. Model I, Level II, 16K; Model III, 16K.

0023R (Tape) $9.95

Home and Personal Programs for your TRS-80

QSL MANAGER

Did you remember to send a QSL card to the op you worked last week? Maybe you sent a QSL, but can't recall getting one in return. The QSL Manager program will help you set up a computerized log book for instant access to your records.

Make complete log entries which include: date, time, call sign, name, band, both the Sent and Received signal reports, the mode, QSL sent/received, and any remarks you may want to add.

No more fumbling with index cards during a QSO, because the QSL Manager has a built-in search function to locate and display information on any call sign in your records. You can even list all the QSO's for a particular date, time, band worked, mode or a specific signal report.

The program will automatically check to see how much memory you have in your system. If you have a two disk, 32K system, you may have a maximum of 1000 entries in your log (500 entries if you have a single disk system). A 48K system limits you to 1400 entries.

These limits are caused by the fact that you have only 350 sectors on a disk. Each entry used 1/4 of a sector, thus the 1400 entry limit.

The program has built-in editing features that help you keep your log book up-to-date.

There's also a command that lets you output your log entries to a printer for hard copy.

In the next QSO, knock their socks off with your infallible memory. Model I, Level II, 16K, Expansion Interface + one disk drive.

0151RD (Disk) $19.95

USER'S TIPS

Keep disk and tape cassettes away from magnetic fields (transformers, speakers, AC motors, magnets, etc.). Strong magnetic fields will destroy information on disks and tapes.

USER'S TIPS

When using a disk drive system, always power up peripherals (expansion interface, disk drives, printer, etc.) before you turn on the TRS-80 CPU/keyboard.

MUSIC MASTER

This quartet of programs lets you make beautiful music—or shall we say, YOUR kind of music.

MICRO ORGAN—A machine-language program that enables you to turn your TRS-80 into an electronic organ or harpsichord. You can choose from a range of four octaves and three voices.

KALEIDOPY—A combination kaleidoscope and player piano. Your computer creates a repeating pattern on the screen and then plays it as music. A special "messing around" section encourages you to modify and improvise the program.

COMPOSER—You generate "loose" or quasi-random music. You learn how to create music and how to control certain aspects of it. Also contains a "messing around" section.

KEYMANIA—It's Gametime! Up to four people can compete, as they try to remember and reproduce a random computer composition. It's a multi-level game, in which you set the tempo.

Bring harmony into your life with Music Master! Model I, Level II, 16K; Model III, 16K.

0084R (Tape) $9.95

Games, and Simulations Entertainment for your APPLE

PADDLE FUN

This new Apple disk package requires a steady eye and a quick hand at the game paddles! We've included four different games to challenge and amuse you. They include:

INVADERS—You must destroy an invading fleet of 55 flying saucers while dodging the carpet of bombs they drop. Keep a wary eye for the mother ship directing the incursion. Your bomb shelters will help you—for a while! Our version of a well-known arcade game. Requires Applesoft in ROM.

HOWITZER—This is a one- or two-person game in which you must fire upon another howitzer position. This program is written in HIGH-RESOLUTION graphics, using different terrain and wind conditions each round, to make this a demanding game. The difficulty level can be altered to suit the ability of the players. Requires Applesoft in ROM.

SPACE WARS—This program has three parts: (1) two flying saucers meet in laser combat—for two players; (2) two saucers compete to see which can shoot out the most stars—for two players; and (3) one saucer shoots the stars in order to get a higher rank—for one player only. Requires Applesoft.

GOLF—Whether you win or lose, you're bound to have fun on our 18-hole Apple golf course. Choose your club and your direction and hope to avoid the sandtraps. Losing too many strokes in the water hazards? You can always increase your handicap. Get off the tee and onto the green with Apple Golf. One of its nicest features is you'll never need to cancel a golf date due to rain. Requires Applesoft.

The minimum system requirement for this package is an Apple II or Apple II Plus computer with 32K of memory and one minidisk drive.

Disk-based version.

0163AD (Disk) $19.95

DOCTOR CHIPS

DR. CHIPS is a great icebreaker at cocktail parties. And if the need arose, he could entertain your early arriving guests while you finished dressing! Your friends will be asking you how the guy got into the computer.

Why shoulder the burdens of modern life in silence? Put your APPLE and DR. CHIPS to work today and get it all off your chest!

You'll need an Apple II (or II Plus), one disk drive, and 20K of RAM.

0254AD (Disk) $14.95

MIMIC

How good is your memory? Here's a chance to find out! In Mimic, your Apple will flash on the screen a sequence of figures on a 3×3 grid. You'll have to respond with exactly the same sequence. It sounds easy, but don't be fooled. There are five different, increasingly difficult versions of the game, including one that will keep going until you're ready to quit. Mimic is exciting, fast-paced, and challenging—a fun game for family and friends. You'll need Integer BASIC and at least 24K of RAM.

0025A (Tape) $9.95

APPLE FUN

We've taken five of our most popular programs and combined them into one tremendous package full of fun and excitement. This disk-based package now offers you these great games:

MIMIC—How good is your memory? Here's a chance to find out! Your Apple will display a sequence of figures on a 3×3 grid. You must respond with exactly the same sequence, within the time limit.

There are five different and increasingly difficult versions of the game, including one that will keep going indefinitely. Mimic is exciting, fast-paced and challenging—fun for all!

AIR FLIGHT SIMULATION—Your mission is to take off and land your aircraft without crashing. You're flying blind, on instruments only.

You start with a full tank of fuel, which gives you a maximum range of approximately 50 miles. The computer will constantly display updates of your air speed, compass heading and altitude. Your most important instrument is the Angle of Ascent/Bank Indicator. It will tell if the plane is climbing or descending, whether banking into a right or left turn.

After you've acquired a few hours flying time, you can try flying a circuit against a map or doing acrobatic maneuvers. With a little more flight time under your belt, the sky's the limit!

COLORMASTER—Test your powers of deduction as you try to guess the secret color code in this Mastermind-type game. There are two levels of difficulty, and three options of play to vary your games. Not only can you guess the computer's color code, but it will guess yours! It will also serve as referee in a game between two human opponents. Can you make and break the color code?

STARSHIP ATTACK—Your mission is to protect our orbiting food station satellites from destruction by an enemy starship. You must capture, destroy or drive off the attacking ship. If you fail, our planet is doomed.

TRILOGY—This fascinating contest of logic has its origins in the simple game of tic-tac-toe. The object of the game is to place three of your colors in a row into the delta-like, multi-level display. The rows may be horizontal, vertical, diagonal and wrapped around, through the "third dimension". Your Apple (or human opponent) will be trying to do the same, and there are many paths to victory. You can even have your Apple play against itself!

Minimum system requirements are an Apple II or Apple II Plus computer with 32K of memory and one minidisk drive. Mimic requires Applesoft in ROM, all others run in RAM or ROM Applesoft.

0161AD (Disk) $19.95

GOLF

Without leaving the comfort of your chair, you can enjoy a computerized 18 holes of golf with a complete choice of clubs and shooting angles. You need never cancel because of rain. One or two players can enjoy this game on the Apple, with Applesoft II and 20K.

0018A (Tape) $9.95

SKYBOMBERS II

Two countries, separated by The Big Green Mountain, are at war. Both nations are equipped with only one means of attack—SKYBOMBERS.

You and your opponent, each representing the nations at war, command opposing fleets of fighter-bombers armed with bombs and missiles. As enemy commanders, each of you has specific orders: Cross that mountain and bomb the enemy blockhouse into oblivion!

Flying over that innocent-looking mountain is not easy for either air force. The aircraft can fire missiles at each other; if that fails, they can ram each other. Sometimes, aircraft encounter falling bombs and are blown to pieces in flight. Desperate pilots can even crash into the enemy blockhouse.

Flight personnel are sometimes forced to parachute from badly damaged aircraft. As they float slowly to earth, they become helpless targets for the enemy to destroy in mid-air.

The sounds of battle are there to remind each commander of his grim responsibility.

Explosions are graphically displayed for both commanders. The scores for both countries are constantly updated at the bottom of the display screen.

Flying these missions develops into a gripping fascination. Air warfare becomes a vivid reality, as you both play the deadly game of Skybombers II.

Tape version requires 16K RAM & Applesoft or Integer Basic. Disk version requires 32K RAM & one disk drive. Both require an Apple II or Apple II plus and game paddles.

0183A (Tape) $9.95
0271AD (Disk) $19.95

SANTA PARAVIA AND FIUMACCIO

Buon giorno, Signore!

Welcome to the province of Santa Paravia. As your steward, I hope you will enjoy your reign here. I feel sure that you will find it, shall we say, profitable.

Perhaps I should acquaint you with our little domain. It is not a wealthy area, Signore, but riches and glory are possible for one who is aware of political realities. These realities include your serfs. They constantly request more food from your grain reserves, grain that could instead be sold for gold florins. And should your justice become a trifle harsh, they will flee to other lands.

Yet another concern is the weather. If it is good, so is the harvest. But the rats may eat much of our surplus and we have had years of drought when famine threatened our population.

Certainly, the administration of a growing city-state will require tax revenues. And where better to gather such funds than the local marketplaces and mills? You may find it necessary to increase customs duties or tax the incomes of the merchants and nobles. Whatever you do, there will be far-reaching consequences. . . and, perhaps, an elevation of your noble title.

Your standing will surely be enhanced by building a new palace or a magnificent *cattedrale*. You will do well to increase your landholdings, if you also equip a few units of soldiers. There is, alas, no small need for soldiery here, for the unscrupulous Baron Peppone may invade you at any time.

For the 48K Apple with Applesoft in ROM.

0174A (Tape) $9.95
0229AD (Disk) $19.95

AIR FLIGHT SIMULATION

Your aircraft is on the runway loaded with fuel, instruments feeding the computer a constant stream of information.

A glance at your flight screen gives you airspeed, altitude, and compass heading. After you take off, the all-important Ascent/Descent-Turn/Bank Indicator will tell you the attitude of your aircraft at a glance, whether you are climbing or diving, whether you are banking into a left or right turn.

Your mission is a short one. You have a maximum possible range of about 50 miles, on one precious tank of fuel. Your objective is to take off, fly the aircraft, and land without crashing.

Since you may not have been at the controls of an aircraft before, the basic flight instructions enclosed will be invaluable. Included are explanations on basic aerodynamics and principles of flight, plus illustrations telling you how to recover from dangerous maneuvers.

Your aircraft will respond rapidly to the controls, and your movements must be delicate. Too much airspeed and your aircraft could explode from overstress. If the airspeed is too slow, you might stall and crash. A clumsy turn, and you might find yourself flying upside down, fighting to regain control.

With Air Flight Simulation and enough flight time, the sky's the limit!

Requires 16K of RAM & Applesoft.

0148A (Tape) $9.95

SAHARA WARRIORS

Now you can enjoy all the gritty realism of desert warfare with the Sahara Warriors package. COMMANDO—You must send your commandos to trap a German general and cut him off from his troops. You'll have the choice of two levels of difficulty. FRENCH FOREIGN LEGION—The battalions of the French Foreign Legion are in a race with the Arabs. Which side will get its battalions into the oasis in the shortest time? You and a friend can find out. This game has four different versions, which even include an occasional sandstorm.

NOTE: Both programs in this package require an Apple with at least 8K and Integer BASIC. The French Foreign Legion program requires the use of game paddles.

0080A (Tape) $9.95

OIL TYCOON

Could you be the world's wealthiest oil magnate? Find out with this action-packed simulation of real-world, cutthroat competition.

Beginning with two million dollars, and armed with the geologist's reports, you'll explore for new wells, exploit existing wells and invest heavily in research and development.

Once you have oil to sell, you can name your own price. Don't get too greedy, or the demand for your oil may dwindle until prices become more attractive.

When the game is over, you may find yourself the wealthiest tycoon around—or you may be the bankrupt victim of too many oil spills, blowouts and dry wells. No matter how you fare, you're sure to find Oil Tycoon both challenging and exciting on your Apple. Requires Applesoft in ROM, 16K.

0079A (Tape) $9.95

for your HEATH

MENTAL GYMNASTICS

Pit your mind against the challenge of these ancient games.

REVERSI—As you and a friend (or the computer) place your pieces on the board, you must each try to capture the opponent's pieces. The score can fluctuate wildly, and nobody can tell who'll win until the last move.

WARI—You can play a friend or the computer in this simple yet intriguing game. The two players take turns removing pieces from one cup and placing them in the other cups. As play continues, the number of pieces decreases. The last player who has a piece to move wins the game. To enjoy these ageless games, you'll need the Heath H-8 with 8K above Benton Harbor Extended BASIC.

0087H (Tape) $9.95

Home/Personal for APPLE

SOLAR ENERGY FOR THE HOME

With the price of fuels rising to astronomical heights, solar space heating systems are starting to become very attractive. But, how do you know if a solar heating installation will be economically feasible? This program can answer that question.

All you do is supply the location, size, interior details and the amount of window space in your home. The program will calculate the current heat loss of your home and the amount of heat gained from any south-facing windows. Then, enter the data for the contemplated solar heating installation. The program will compute the net heating gain and give you the cost of using conventional fuels versus using solar heat. It will even calculate the payback period and show you if your contemplated investment in solar heating will save you money.

For anyone seriously considering the advantages and economics of a solar conversion, this package can provide practical guidance. For professionals designing and installing solar systems, it's a must.

Requires Applesoft BASIC, a single disk drive and a minimum of 28K of RAM.
0235AD (Disk) $34.95

ASTROLOGY

Astrology is at once a science and an art. The heavenly bodies are believed to exert an influence upon the destinies of each individual—a destiny predetermined by a universal order resulting from (or coinciding with) the position of the planets in our solar system.

The astrological chart, or horoscope, is drawn as a map of the heavens at the exact time of a person's birth. A horoscope is an illustration of (1) the "planets" and their location within (2) the twelve signs of the Zodiacal Circle and (3) the twelve houses through which the heavenly bodies must pass. The sign which is in the ascendant (Eastern Horizon) at the time of birth is also of great significance.

This program draws your astrological chart using either the tropical or sidereal zodiac. After you enter your birth data in response to the on-screen prompts, your Apple will calculate and then display your individual horoscope. Once the horoscope has been cast, the program will list the angular relationships (aspects) of all of the "planets".

Note: This program makes no attempt to interpret the multitude of facts and relationships of a specific horoscope. For this information, we recommend that you consult a standard text on astrology or an experienced astrologer.

Knowledge of Astrology a necessity to use this program.

Minimum System: Apple II (or II Plus), one disk drive, 28K of RAM and Applesoft.
0242AD (Disk) $19.95

for your NORTHSTAR

TRAFFIC ACCIDENT ANALYSIS AND RECONSTRUCTION

by Haim Reizes

Highway accidents, resulting in fatalities, injuries, and property damage, generally lead to prolonged litigation. The Traffic Accident Analysis and Reconstruction (TAAR) System will provide you with programs and analytical techniques to solve the equations involved in motor vehicle accidents. The System will present a reconstruction methodology utilizing physical evidence at the scene and a conclusive determination of the probable cause.

The purpose of this system is to provide accurate conclusions regarding the operational factors and dynamics contributing to highway accidents. The TAAR System deals with the basic calculations of the common types of accidents and also explains and applies the various formulas of automobile kinematics.

The TAAR System is the result of Mr. Reizes' 25 years in the accident investigation field. These programs are invaluable to insurance casualty companies, accident investigators, plaintiff and defense attorneys, fleet safety directors, and police officials handling automobile accident cases.

This package requires the North Star Horizon II microcomputer with 48K of memory, two disk drives and the North Star Disk Operating System (DOS) version 5.0.
0173ND (Disk) $499.95

Texas Instruments

SANTA PARAVIA AND FIUMACCIO

The year is AD 1400, and you are the ruler of a tiny Italian city-state. You are ambitious by nature and intend to build your little city-state into a powerful kingdom.

So begins Santa Paravia and Fiumaccio, where you and your fellow players compete as rulers of neighboring cities. You control the grain harvest, feed your people, set tax rates, exercise justice, and invest in public works.

Life was short back then, and you'll have only a limited amount of time in which to build your kingdom. The lives of your serfs will depend on your decision. If they are wise, then your city-state will grow and you will acquire loftier titles. If your rule is incompetent, your people will starve and your city-state may be invaded by your neighbors.

You can play the game yourself or up to six players may compete at one time. Either way, you're sure to find your route to the throne a challenging road.

How will you rule your kingdom? Will you become unscrupulous and follow the example set by Niccolo Machiavelli in his book on government, The Prince—or will you be a benevolent ruler—an iron fist in a velvet glove? Only you can answer that question—with the Santa Paravia and Fiumaccio program. For TI99/4 Microcomputers.
0273TI (Tape) $9.95

for your PET

CODE NAME: CIPHER

Now you can enjoy the feeling of intrigue with the CODE NAME: CIPHER software package. This enigmatic quartet of programs is a puzzle lover's delight. They include:

MEMORY GAME—The computer will shuffle a deck of cards and lay them out face down. You take turns choosing two cards and trying to match a pair. You can adjust the computer's "IQ" so that its memory is as fallible as yours.

CODEMASTER—One player types in a word, phrase or sentence and the PET translates it into a cryptogram. The other player must break the code and solve the cryptogram in the shortest time possible. The computer keeps score and will offer hints—but you lose points if you accept them.

DECEITFUL MASTERMIND—This isn't your ordinary mastermind type of game. You must guess the five letters in the hidden code word. The computer will give you hints as to how close your guesses are. But it can (optionally) give you false hints . . . up to nine per game, that can lead you astray. For one player.

CODE BREAKER—Cracking this code won't be easy. The computer (or a human opponent) will enter a sequence of three, four or five secret symbols. You'll have to guess which symbols are used and their correct sequence. The fewer guesses, the higher your score. If you want to pit your wits against the relentless logic of the computer, then Code Name: Cipher is for you. Requires an 8K PET.
0112P (Tape) $9.95

PET UTILITY I

This two-program package includes:

MONITR—You can edit, save and verify any machine-language program while still allowing you access to BASIC. It allows you to: (1) display or modify memory in hexadecimal notation, (2) disassemble memory, (3) execute programs, (4) save, verify or load machine language tapes, and (5) move back and forth between BASIC and MONITR. It automatically displays register contents and processor status bits whenever it encounters a BRK instruction. It resides in high memory, so it is compatible with BASIC. (Old ROM only.)

PROGRAMMER'S CALCULATOR—This program will do more than the Texas Instruments' Programmer Calculator. Not only will the program convert numbers into binary, octal, decimal and hexadecimal systems and function as a floating point calculator, but it will also display all four numbers, simultaneously. It will handle numbers so large, they're limited only by the size of your screen! (Either ROM.)

The PET Utility I package, a tool for all your tomorrows. For 8K PETs.
0105P (Tape) $9.95

DUNGEON OF DEATH

"Those who seek the Holy Grail
Must fight and walk a tortuous trail.
Eleven monsters thou must fight,
Whilst searching through eternal night."

Count Stan of Santa Paravia
A.D. 1380-1402

Thus begins your quest in search of the Holy Grail, wherein you must descend through the twelve levels of the Dungeon of Death, find the Holy Grail, and return to the surface with it.

The Holy Grail is guarded by Smaug, the most fearsome monster of all, and ten lesser breeds of monsters. These gruesome beings will challenge your every step. You can only survive by using all the powers at your command.

You'll be able to cast magic spells, drink potions that may or may not help you, and open chests in search of gold or items that will help you fight the monsters.

Step softly in the darkness. Treasure or sudden death is only a footfall away in the Dungeon of Death! Requires an 8K PET.
0064P (Tape) $9.95

QUBIC 4/GO MOKU

Play two ancient games on your modern PET. The two programs included are:

QUBIC 4—Play a multi-dimensional game of tic-tac-toe.

GO-MOKU—Line up five of your men while blocking the PET's moves.

These one player games require 8K of memory.
0038P (Tape) $9.95

MIMIC

Test your memory and reflexes with the five different versions of this game. You must match the sequence and location of signals displayed by your PET. This one-player program includes optional sound effects with the PET. 8K.
0039P (Tape) $9.95

SANTA PARAVIA AND FIUMACCIO

The year is AD 1400, and you are the ruler of a tiny Italian city-state. You are ambitious by nature and intend to build your little city-state into a powerful kingdom.

So begins Santa Paravia and Fiumaccio, where you and your fellow players compete as rulers of neighboring cities. You control the grain harvest, feed your people, set tax rates, exercise justice, and invest in public works.

Life was short back then, and you'll have only a limited amount of time in which to build your kingdom. The lives of your serfs will depend on your decision. If they are wise, then your city-state will grow and you will acquire loftier titles. If your rule is incompetent, your people will starve and your city-state may be invaded by your neighbors.

You can play the game yourself or up to six players may compete at one time. Either way, you're sure to find your route to the throne a challenging road.

How will you rule your kingdom? Will you become unscrupulous and follow the example set by Niccolo Machiavelli in his book on government, The Prince—or will you be a benevolent ruler—an iron fist in a velvet glove? Only you can answer that question—with the Santa Paravia and Fiumaccio program. This classic program will give you hours of enjoyment. Your software library isn't complete without Santa Paravia and Fiumaccio. Requires a 16K PET.
0175P (Tape) $9.95

AIRMAIL PILOT
The Chicago Sun
July 18, 1922
—WANTED—

Airmail pilot for the
Columbus to Chicago run.
Must be willing to fly in
every kind of weather. Only
the foolhardy need apply.

Let the Airmail Pilot package take you to the early days of aviation history. Your plane is the Curtis JN4-D, affectionately known as the Jenny. You must fly the mail from Columbus to Chicago.

The Jenny carries only 26 gallons of fuel. You'll have to stop along the way. Bad weather may force you down. Electrical storms may turn your aircraft into a mass of flaming wreckage, or ice may form on your wings and plunge you to certain death below. But, the mail must get through.

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APPLE GAMES, SIMULATIONS & ENTERTAINMENT

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Santa Paravia & Fiumaccio (Tape)	0174A	9.95	14
(Disk)	0229AD	19.95	14
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(Disk)	0271AD	19.95	14

APPLE HOME AND PERSONAL

Program Name	Order No.	Price	Page
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PET

Program Name	Order No.	Price	Page
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NORTHSTAR

Program Name	Order No.	Price	Page
T.A.A.R. (Disk)	0173ND	$499.95	15

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It's Microsoft's Z-80 Softcard, which introduces your Apple to the world of CP/M and MBASIC.

Zapple II— What the Heck Is That?

By William O'Brien

No matter what stigma it places upon me, I must confess that I was on the verge of dumping my Apple II, with its lousy operating system. There, I said it. *Lousy* operating system. And I was going to dump it for a song compared to what I paid, just to get it out of my sight.

The DOS operates like a journey through a cryptologist's nightmare, the BASIC lacks the most rudimentary formatting routines, there is no renumber feature in its floating-point version of BASIC, the highly-touted graphics are a pain to access and editing a program line is plain tedious. It makes a nice toy for which people have developed a few games, but I had higher hopes.

I didn't sell it. Instead, something wonderful happened. Microsoft introduced the Z-80 Softcard for the Apple.

The important part is that now my Apple runs honest-to-God MBASIC (also known as BASIC-80 and BASIC 5.0). No more will I toil through the valley of control character 4 [CHR$(4)] or the seas of whether or not to use the carriage return [CHR$(13)] with it when using TRACE or MON C,I,O. I'm in seventh heaven.

I might mention that it also runs true CP/M (version 2.2), which is to software very much what bread is to a sandwich.

Designed by Burtronix, and built by California Computer Systems, the Softcard is actually a Z-80A running at 2 MHz. It has provisions for two system environments: a 48K machine and a 48K machine with a language card. These produce a 44K and a 56K host system, respectively (an additional 12K of memory is added to the system with the language card). A disk drive is mandatory; two would be great.

The CP/M operating system occupies 7K bytes of memory (5K when executing user programs); when combined with MBASIC, 29K bytes. Another version of BASIC, called GBASIC and available to 16-sector DOS 3.3 users, is included in the system and used to access the hi-res graphics of the Apple. Total memory overhead with it is just a little more than 39K bytes.

This means that without the language card there is only 14K or 5K (depending on which version of BASIC used) of usable program area.

(I hear you now. That's $350 for the Softcard and another $495 for the language card, almost $1000. But no, Microsoft will soon be releasing a 12K memory card for the Apple that will cut that price substantially.)

The board itself plugs into either slot 4 or slot 7 of the Apple motherboard, and the software comes in ei-

AUTO	An automatic numbering routine with starting line number and increments user-selectable.
BUTTON(n)	Determines if a paddle button has been pressed.
BEEP	Generates a tone from the Apple speaker.
CHAIN/COMMON	Similar to the Apple Merge command.
EDIT	With a line number specified, you can then use the I command to insert text; the D command to delete text (nD will delete the next n characters after the cursor); n S ch takes the cursor to the nth occurrence of the character ch; L lists the line to be edited; Q quits the editing mode and cancels all changes (pressing return saves all changes).
ERASE	Allows redimensioning of arrays by erasing the previous dimension.
ERR and ERL	The first returns the error code for the misfunction (no more Peek(222)), the second returns the line number in which it occurred.
INKEY$	A keyboard read command that returns the current character entered at the keyboard. If none, then it returns a null.
IF . . . THEN . . . ELSE	Similar to Apple's IF . . . THEN; however, it allows an alternative move if the comparative fails.
LPRINT/LLIST	Replaces the tedious PR#1 command for printing data or listing files at the printer, automatically returns control to the keyboard.
POP	Used to cancel the last GOSUB in nested GOSUB statements (when a POP is found, RETURN will return program control to the GOSUB immediately preceding the last one).
PRINT USING	A formatting command for alphanumeric screen or printer output. PRINT USING "$$####.##";N will produce the output $ 34.89 given a value of 34.89443 for N.
RENUM	A renumbering command directly accessible from BASIC.
STRING$(n,ch)	Returns a string of characters, ch, with length n. ch may be a literal (DOG) or a variable, or a CHR$ character designation.
SWAP	Literally swaps the values of two variables.

Table 1.

Address correspondence to William O'Brien, Computerland, 58 W 44th, New York, NY 10036.

ther 13-sector or 16-sector disk format. To activate the board you can either boot up with the Softcard system diskette or else use the PR#n or IN#n command (n is the slot number of the card) with the diskette in the drive.

Booting the system brings up CP/M. If you type DIR you can get a complete catalog of all programs (a system disk, as supplied by Microsoft, has about 3K of free space). Copies of the master diskette can be made even with a single drive. Complete file space allocation and available disk storage can be had using the statistics utility. Under CP/M, as under Apple's DOS, no quotation marks are necessary to access a file.

You can spend hours running through the instruction manual discovering the utilities supplied with the CP/M system (aside from the additional programs available for the Apple CP/M machine from Lifeboat). It's BASIC where the most obvious advantages are found.

There are several instructions not found in Applesoft, and they are shown in Table 1.

To Carriage Return or Not to Carriage Return

Remember the Apple's wonderful way of using disk files?

```
PRINT CHR$(4);"OPEN MYFILE"
PRINT CHR$(4);"WRITE MYFILE"
PRINT variable
```

Nice way to go, right?

Perhaps you wanted to use the MON or TRACE functions with the printer while accessing the disk. These functions require adding CHR$(13). The result on the printer is linefeed after linefeed for every disk routine.

How about this:

```
OPEN "O", 1, "MYFILE"
PRINT#1, variable
```

Here "O" tells the computer that the variable's value is going out of the buffer (number 1 is the buffer or holding area we've selected here) onto the disk.

Or:

```
OPEN "I", 1, "MYFILE"
INPUT#1, variable
```

"I" specifies input from the disk file into buffer number 1 (these are examples of sequential-access disk routines). You must, however, use quotation marks when referring to a file in MBASIC—not a requirement under Applesoft.

Without a doubt, random access is a bit more difficult with MBASIC than with Applesoft; and, thankfully, there are no provisions for tape I/O. But the trade-off is well worth it.

In a nutshell, the Softcard is one of the first devices for the Apple that actually lets it live up to its potential. Also, there will soon be a compiler for it, and, of course, all of the myriad CP/M-based software.

It's a shame, though. Now I'm thinking of selling my TRS-80.■

APDOS	Utility to transfer Apple DOS data to CP/M disk.
ASM	CP/M 8080 assembler.
CONFIGIO	Utility to configure Apple CP/M environment to your particular system configuration.
COPY	Disk copy program.
DDT	Dynamic debugging tool for 8080 assembly-language programs.
DOWNLOAD	Used with Upload program included in manual to transfer programs between the Apple and another CP/M system.
DUMP	Displays contents of disk file in hex form.
ED	CP/M text editor.
FORMAT	Formats diskettes to accept data (will not boot).
LOAD	Used to convert hex program into machine executable code.
MBASIC	Microsoft low-res manipulative BASIC.
PIP	Inter-disk transfer of files, also used to copy and append files or transfer them to the terminal or printer.
STAT	Provides general file information and the ability to manipulate them.
SUBMIT	Permits commands and program input lines to be executed from disk rather than the keyboard.
XSUB	When used with Submit, allows character input from a disk file at all times during execution of programs.
The following are only available on the 16-sector version:	
CPM56	Reorganizes a 44K system CP/M disk.
GBASIC	Hi-res version of MBASIC.
RW13	Allows access to 13-sector files from 16-sectored CP/M disk.

Table 2. Programs included on Softcard disk.

Maxi Manager

The finest Data Base Manager Available

DATA MANAGEMENT PROGRAM COMPARISON CHART

	CCA DATA MANAGER	AIDS III with CALS	MAXI MANAGER	RADEX 10	PROFILE
FILE CAPACITY & FORMAT					
Maximum # of disks per file	1	1	4	31	4
Maximum # of records per file	2450	Note 1	32,767	10,199	65,535
Maximum record length	249	254	800	255	255
Maximum # of characters per field	249	254	40	254	255
Maximum # of fields	24	20	20	127	153
Maximum # of characters per field label	15	10	19	12	765
Variable length records (pack sectors)	No	Note 2	Yes	No	No
FIELD TYPES					
Alphanumeric	Yes	Yes	Yes	Yes	Yes
Numeric	Yes	Yes	Yes	Yes	No
Fixed decimal numeric	Note 4	Yes	Yes	No	No
Date (MM/DD/YY)	Yes	No	Yes	No	No
Extended date (MM/DD YYYY)	No	No	Yes	No	No
Calculated equation	Note 5	Note 6	Yes	No	No
Permanent fields	Yes	No	No	No	No
SORTING					
Machine language assisted	No	Yes	Yes	Note 7	Yes
Sort by any field	Yes	Yes	Yes		Yes
Number of Sort Key files	1	1	5		1
Numeric sort	Yes	Yes	Yes		No
Ascending sort	Yes	Yes	Yes		Yes
Descending sort	Yes	Yes	Note 11		Yes
Sort within a selected range	No	No	Yes		No
Sort multiple fields simultaneously	Yes	Yes	No		No
FILE MAINTENANCE					
Fixed length input fields	Yes	Yes	Yes	Yes	Yes
Single key entry of common data	No	No	Yes	No	No
Single field EDIT selection	Yes	Yes	Yes	Yes	Yes
Skip record (next or previous)	Yes	Yes	Yes	No	Yes
Search & EDIT record	No	Yes	Yes	No	Yes
Search & DELETE record	No	Yes	Yes	No	No
Auto rejection of alphanumeric data in numeric field	Yes	No	Yes	No	No
RECORD SELECTION TECHNIQUES					
Record number	Yes	Yes	Yes	Yes	No
Binary search (high speed)	No	No	Yes	No	No
Maximum # of simultaneous keys	1	4	10	31	1
RELATIONAL COMPARISONS					
Equal	No	Yes	Yes	Yes	Yes
Not equal	No	Yes	Yes	No	Yes
Greater than	No	Yes	Yes	Yes	Yes
Less than	No	Yes	Yes	Yes	Yes
Instring	Yes	No	Yes	Yes	No
AND / OR	No	No	Yes	Yes	No
Wild card masking	No	No	Yes	No	No
PRINTING					
User specified page title	Note 8	Yes	Yes	No	Note 10
User specified column headings	No	No	Yes	No	Yes
Automatic page numbering	Yes	Yes	Yes	Yes	Yes
Right justification	No	Yes	Yes	No	No
User defined column widths	Yes	No	Yes	Yes	Yes
User defined column separators	No	No	Yes	No	No
Keyboard entered columnar values	No	No	Yes	No	No
Merge data into form letters	No	No	Yes	No	No
Form filling applications	No	No	Yes	No	No
Columnar totals	Yes	Yes	Yes	No	No
Columnar subtotals generated upon change in a specific field	Yes	Yes	Yes	No	No
Built in screen print	No	No	Yes	No	No
MISCELLANEOUS					
Cost	$75.00	$94.90	$99.95	$99.00	$79.95
Punctuation allowed within data fields	Yes	?	Yes	Yes	Yes
Upper / Lower case	Note 3	Note 3	Yes	Note 3	Note 3
Built in RS-232-C driver	Note 3	Note 3	Yes	Note 3	Note 3
Built-in TRS-232 driver	Note 3	Note 3	Yes	Note 3	Note 3
Programmer's interface	Note 9	Note 9	Yes	No	Note 9
Sample DATA disk	No	No	Yes	No	No
Documentation (# of pages)	?	?	120	38	29

NOTE 1: File size is dependant on memory size.
NOTE 2: Sequential files only.
NOTE 3: User must apply own driver routine.
NOTE 4: Hard copy print out only
NOTE 5: Four functions (+ - * /) only
NOTE 6: Same as note #5 with a maximum of two calculated fields.
NOTE 7: Available as a separate program for $99.95.
NOTE 8: 120 character maximum.
NOTE 9: Data structures defined in manual.
NOTE 10: 132 characters maximum.
NOTE 11: User option (files can be read from ascending or descending order).

The jury is in and the verdict is . . . "outstanding!" Reviews from all of you who purchased MAXI MANAGER (not to mention raves by many top microcomputing magazines) have heralded it as the definitive data base managing system. We knew that business owners and hobbyists demanded the finest data base managing system available. To all of you who praised us for MAXI MANAGER, we extend our thanks. And to those of you who have yet to try MAXI MANAGER, we invite you to experience this incredible system today. But don't take our word for it (or our jury's). Judge for yourself.

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Get a handle on your data with these data/mailing labels programs in North Star BASIC.

North Star Data Manager

By L. Kirk Benedict

Database programs make it possible for office personnel with no knowledge of programming to create and maintain their own database. DATAKEEP can be used to create the database, make alterations and display the entire database on the CRT or print a hard copy of it. The DATASORT program is used to sort the records and to search for a specific entry. Sorted records or records found as a result of a search can be written onto a separate disk file. DATAMAIL is used to print mailing labels when the appropriate information has been placed in a file.

DATAKEEP

The database programs were designed with some of my own applications in mind. I wanted all of the information to be stored in a single file so that it could easily be moved from disk to disk. I have purposely avoided approaches that require separate files for labels and parameters.

Since I frequently use my Soroc-120 terminal for editing and retrieval, I wanted to restrict the display to a maximum width of 80 characters. To make it easier to write special programs that would perform calculations on scientific data, I wanted numeric input to be stored as numbers in the data field, rather than storing numbers as strings. This increased the need for trapping input errors and avoiding input which would be too large for the designated field. Of course, I wanted to be able to vary the number and width of the fields to suit individual applications.

These programs are written in North Star BASIC Release 5. My system has 32K of memory, almost half of which is occupied by the disk operating system and the BASIC interpreter. These programs could be compacted significantly by removing remarks, spaces and indentations. If the memory available for this program is limited, the number of statements placed on each line of the program might be increased. It is also possible to write a smaller, separate program for each of the options.

The programs use random access data files. North Star BASIC lets the programmer make records of any convenient length. DATAKEEP (Listing 1) automatically creates type-12 data files, so that the database files can easily be identified in the disk directory.

The ERRSET in line 580 is used to trap the errors that occur if the operator enters the name of the file incorrectly or if he attempts to enter a string where numeric input is required. In other versions of BASIC, line 580 and lines 3950 through 4030 might be eliminated.

INCHAR$(0) is a North Star BASIC input statement which accepts the next single character which is entered on the keyboard, and does not need to be followed by a carriage return. A traditional input statement could be substituted in versions of BASIC which do not have this feature. The FILL statement in line 1870 inhibits control-C and prevents the operator from interrupting the execution of the program while it is writing information in the data file. The control-C inhibit is removed in line 2180.

Those who try to convert this program to other dialects of BASIC should note that North Star BASIC will execute other statements on the same line if the evaluation of an IF... THEN statement is false. North Star BASIC does not use string arrays, and it does not have the LEFT$, MID$ and RIGHT$ functions. C$(5,20) indicates a substring of C$, where the first character of the substring is the fifth character of C$, and the last character of the substring is the 20th

```
PROGRAM TITLE- DATAKEEP
**********************

WHICH OPTION?
    A) INITIALIZATION FOR NEW DATA FILE
    B) ENTER DATA
    C) MAKE CHANGES IN DATA
    D) DISPLAY ALL DATA
    E) SEARCH FOR SPECIFIC RECORD
    F) EXAMINE PARAMETERS FOR A DATA FILE
    G) SORT
    H) REVISE LABELS FOR FIELDS
    I) PRINT MAILING LABELS
    J) END PROGRAM
```

Fig. 1. DATAKEEP menu.

L. Kirk Benedict is dean of the School of Pharmacy at Creighton University, 2500 California St., Omaha, NE 68178.

character of C$.

A$ is used to clear the screen on my Soroco terminal, and is defined in line 550. Some substitution may be necessary here for those who use terminals that clear the screen in some other manner. Likewise, the cursor is addressed to a specific location on the screen of my Soroc terminal by the function which is defined in line 950. CHR$(7) rings a bell at the terminal, and CHR$(12) sends a form feed to the printer.

The program options for DATAKEEP are listed in lines 960 through 1050. The data file is created with option A (see Fig. 1). The operator is required to enter the name of the new data file and the number of alphanumeric and numeric fields which the database will contain. The database will hold up to ten alphanumeric fields and up to ten numeric fields. The number of characters in each of the alphanumeric fields must be specified. The number of characters in each of the alphanumeric fields has been arbitrarily limited to a maximum of 75 characters by line 590 and line 1170, but, of course, these lines could be modified to suit individual needs.

For each of the numeric fields, you must specify the maximum number of characters to be printed in each of these fields and the number of places to the right of the decimal point to be included in the field. When entering the maximum number of characters to be placed in a numeric field, you must remember to include the minus sign and the decimal point, if these will be used.

I recommend that each numeric field contain at least one place to the

Listing 1. DATAKEEP program.

```
100 REM DATAKEEP - REVISION 3.5
110 REM COPYRIGHT BY KIRK BENEDICT, JUNE 27, 1980.
120 REM
130 REM MAXIMUM 10 ALPHANUMERIC FIELDS FOLLOWED BY MAXIMUM 10 NUMERIC
140 REM MAXIMUM ALPHANUMERIC FIELD SIZE IS 75 CHARACTERS
150 REM SPECIFIED NUMBER OF CHARACTERS IN NUMERIC FIELD
160 REM   MUST INCLUDE MINUS SIGN AND DECIMAL POINT, IF USED
170 REM RECOMMEND AT LEAST ONE PLACE TO LEFT OF DECIMAL POINT
180 REM   OTHERWISE ALL ENTRIES MUST BE <1 AND >0
190 REM   (ASSUME ZEROS ARE PRINTED IN UNITS COLUMN)
195 REM PREFFERED LINE LENGTH (L1) IS 79 FOR CRT, 131 FOR COMPRESSED PRINT
200 REM
210 REM IDENTIFICATION OF VARIABLES
220 REM     A$      = CLEAR SCREEN
230 REM     B$      = NAME OF DATA FILE
240 REM     C$      = ALPHA FIELD ENTRIES (77 BYTES MAX)
250 REM     D$,D1$  = LABELS FOR FIELDS
260 REM     I,J,K   = LOOP COUNTERS
265 REM     L1      = LINE LENGTH
270 REM     N1      = NUMBER OF ALPHANUMERIC FIELDS
280 REM     N2      = NUMBER OF NUMERIC FIELDS
290 REM     N3      = NUMBER OF RECORDS WHICH DATA FILE WILL HOLD
300 REM     N4      = ACTUAL NUMBER OF RECORDS IN DATA FILE
310 REM     N5      = ACTUAL NUMBER OF BLOCKS IN DATA FILE
320 REM     P       = POINTER FOR RANDOM ACCESS
330 REM     P2      = DETERMINES PRINT OUTPUT PORT
340 REM     S(N)    = NUMBER OF CHARACTERS IN ALPHANUMERIC FIELD N
350 REM     F(N),A  = NUMBER OF CHARACTERS IN NUMBERIC FIELD N
360 REM               (INCLUDES DECIMAL POINT & MINUS SIGN)
370 REM     D(N),B  = NUMBER OF PLACES TO THE RIGHT OF THE DECIMAL PLACE
380 REM     R       = BYTES IN EACH RECORD
```

More →

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Listing 1 continued.

```
390 REM     T       = TABSET
400 REM     X,X$    = INPUT FOR OPTIONS
410 REM
420 REM    *** FIRST 335 BYTES OF DATA FILE AND ADDRESS ***
430 REM       0  NUMBER OF ALPHANUMERIC FIELDS (MAX 10)
440 REM             LENGTH OF EACH
450 REM      55  NUMBER OF NUMERIC FIELDS (MAX 10)
460 REM             NUMBER OF CHARACTERS IN EACH
470 REM     110     PLACES TO RIGHT OF DECIMAL POINT FOR EACH
480 REM     160  BYTES PER RECORD
490 REM     165  ACTUAL NUMBER OF RECORDS IN FILE
500 REM     170  RESERVED FOR FUTURE USE
510 REM     175  LABELS FOR FIELDS
520 REM     255  UNDERLINE LABEL FOR FIELDS
530 REM
532 L1=79 \ LINE #0,80 \ LINE #1,L1+1
534 L2=EXAM(11537)+EXAM(11538)*256 \ REM ADDRESS OF PRINT HEAD TABLE
550 A$=CHR$(27)+CHR$(43)\!A$
560 !"PROGRAM TITLE- DATAKEEP"
570 !"**********************"
580 ERRSET 3960,E1,E2
590 DIM C$(75),C1$(75),D$(L1-1),D1$(L1-1),S(11)
600 REM FUNCTIONS FOR FORMATTING NUMERIC OUTPUT USING VARIABLES
610 REM RIGHT JUSTIFY BY PUTTING SPACE IN FRONT OF ALL NUMBERS
620 DEF FNZ$(A,B,X)
630   Z=A-(B+1)
640   IF B=0 AND X=0 THEN 700 \ IF X<=0 THEN Z=Z-1 \ IF X=0 THEN 700
650   IF B=0 THEN IF X<0 THEN Z=A-1 ELSE Z=A
660   IF X<0 AND X>-1 THEN Z=Z+1
670   FOR L=0 TO 6
680     IF ABS(INT(X))>=10^L AND ABS(INT(X))<10^(L+1) THEN Z=Z-(L+1)
690   NEXT L
700   Z$=CHR$(0)
710   FOR L=1 TO Z
720     Z$=Z$+" "
730   NEXT L
740   RETURN Z$
750   FNEND
760 REM ROUND NUMBER TO SPECIFIED NUMBER OF DECIMAL PLACES
770 DEF FNA(B,X)=INT(X*10^B)/10^B
780 REM ADD TRAILING ZEROS
790 DEF FNY$(B,X)
800   Z$=CHR$(0)
810   Z=INT(X*10^B)/10^B
820   Y3=Z-INT(Z)
830   IF Y3>0 THEN 860
840     Z$="." \ IF B=0 THEN Z$=CHR$(0)
850     V=B \ GOTO 890
860   Y$=STR$(Y3)
870   L=LEN(Y$)-2
880   V=B-L
890   FOR P=1 TO V
900     Z$=Z$+"0"
910   NEXT P
920   RETURN Z$
930   FNEND
940 REM ADDRESS CURSOR TO SHOW INPUT STRING LIMIT
950 DEF FNX$(X,Y)=CHR$(27)+"="+CHR$(Y+31)+CHR$(X+31)
960 !\!"WHICH OPTION?"
970 !"    A) INITIALIZATION FOR NEW DATA FILE"
980 !"    B) ENTER DATA"
990 !"    C) MAKE CHANGES IN DATA"
1000 !"    D) DISPLAY ALL DATA   [DEFAULT]"
1010 !"    E) SEARCH FOR SPECIFIC RECORD"
1020 !"    F) EXAMINE PARAMETERS FOR A DATA FILE"
1030 !"    G) SORT"
1040 !"    H) REVISE LABELS FOR FIELDS"
1045 !"    I) PRINT MAILING LABELS"
1050 !"    J) END PROGRAM"\!
1060 X$=INCHAR$(0) \ X4=ASC(X$)-64 \ !A$ \ IF X4=-51 THEN 3120
1065 IF X4>0 AND X4<11 THEN 1070 \ GOSUB 3770 \ GOTO 960
1070 ON X4 GOTO 1110, 1860, 2210, 3120, 1080, 3510, 1080, 3700, 1085, 1090
1080 CHAIN "DATASORT"
1085 CHAIN "DATAMAIL"
1090 CHAIN "CHAIN"
1100 REM OPTION A STARTS HERE
1110 S(0)=0 \ F(0)=0 \ S(11)=0 \ T=0
1120 INPUT "WHAT IS THE NAME OF THE DATA FILE? ",B$ \ B1$=B$
1130 !\INPUT "HOW MANY ALPHANUMERIC FIELDS? ",N1
1140 IF N1<=10 AND N1>=0 THEN 1150 \ GOSUB 3770 \ GOTO 1130
1150 FOR I=1 TO N1
1160   !TAB(5), "HOW MANY CHARACTERS IN ALPHA FIELD NO.",I," ",
1170   INPUT S(I) \ IF S(I)>0 AND S(I)<76 THEN 1180 \ GOSUB 3770 \!\ GOTO 1160
1180   S(0)=S(0)+S(I)+2 \ S(11)=S(11)+S(I)
1190 NEXT I
1200 !\INPUT "HOW MANY NUMERIC FIELDS? ",N2
1210 IF N2<=10 AND N2>=0 THEN 1220 \ GOSUB 3770 \ GOTO 1200
1220 FOR I=1 TO N2
1230   !TAB(5), "HOW MANY CHARACTERS IN NUMERIC FIELD NO.",I," ",
1240   INPUT F(I) \ IF F(I)>0 THEN 1250 \ GOSUB 3770 \ ! \ GOTO 1230
1250   F(0)=F(0)+F(I)
1260   !TAB(10), "HOW MANY FIGURES TO THE RIGHT OF THE DECIMAL IN THIS FIELD ";
1270   INPUT D(I) \ IF D(I)<0 THEN 1290 \ IF D(I)=0 THEN 1300
1280   IF D(I)<=F(I)-1 THEN 1300
1290   GOSUB 3770 \ GOTO 1260
1300 NEXT I
1310 REM CALCULATES SPACE BETWEEN LABELS FOR EACH FIELD
1320 REM N2 IS FOR SPACE THAT PRECEDES EVERY NUMBER PRINTED
1330 T=(L1-(S(11)+F(0)+N2))/(N1+N2) \ T=INT(T)
1340 IF T>1 THEN 1370
1350   !\!"TOO MANY CHARACTERS FOR DISPLAY ON CRT!!!"
1360   !"PLEASE START OVER." \ ! \ GOTO 1110
1370 !\INPUT "HOW MANY RECORDS WILL THE DATA FILE HOLD?",N3
1380 R=S(0)+(5*N2) \ REM BYTES PER RECORD
1390 CREATE B$,((R*N3)+335)/256,12
1400 OPEN #1%12, B$
1410 WRITE #1 %0, N1,NOENDMARK
1420 FOR I=1 TO N1 \ WRITE #1, S(I),NOENDMARK \ NEXT I
1430 WRITE #1 %55, N2,NOENDMARK
1440 FOR I=1 TO N2 \ WRITE #1, F(I), NOENDMARK \ NEXT I
1450 FOR I=1 TO N2 \ WRITE #1 %110+(I-1)*5, D(I),NOENDMARK \ NEXT I
1460 WRITE #1 %160, R,0,0,NOENDMARK
1470 !A$
1480 D$=CHR$(0) \ S(0)=0 \ F(0)=0
1490 FOR I=1 TO N1
1500   S(0)=S(0)+S(I)
1510   !"ENTER LABEL FOR ALPHANUMERIC FIELD #",I
1520   !FNX$(S(I)+2,2*I+1),"<",
1530   !FNX$(1,2*I+1),
1540   INPUT C$
1550   IF LEN(C$)<=S(I) THEN 1560 \ GOSUB 3770 \ GOTO 1510
1560   D$=D$+C$
1570   IF I=1 THEN D$=D$(2,LEN(D$))
1580   IF LEN(D$)>=S(0)+T*(I-1) THEN 1590 \ D$=D$+" " \ GOTO 1580
1590   FOR K=1 TO T \ D$=D$+" " \ NEXT K
1600 NEXT I \ !A$
1610 F(0)=LEN(D$)
1620 FOR I=1 TO N2
1630   F(0)=F(0)+F(I)+1
1640   !"ENTER LABEL FOR NUMERIC FIELD #",I
1650   !FNX$(F(I)+2,2*I+1),"<",
1660   !FNX$(1,2*I+1),
1670   INPUT C$
1680   IF LEN(C$)<=F(I) THEN 1690 \ GOSUB 3770 \ GOTO 1640
1690   IF D$<>CHR$(0) THEN 1710
1700     D$=" "+C$ \ F(0)=F(I)+1 \ GOTO 1720
1710   D$=D$+" "+C$
1720   IF LEN(D$)>=F(0)+T*(I-1) THEN 1730 \ D$=D$+" " \ GOTO 1720
1730   FOR K=1 TO T \ D$=D$+" " \ NEXT K
1740 NEXT I
```

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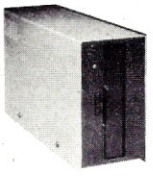

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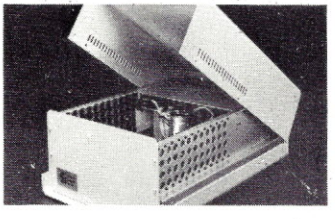

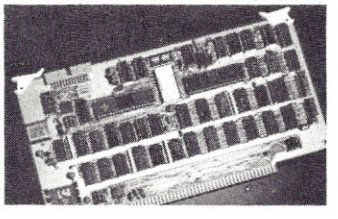

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Listing 1 continued.

```
1750 IF LEN(D$)>=L1-1 THEN 1760 \ D$=D$+" " \ GOTO 1750
1755 IF L1<80 THEN 1760 \ D1$="   " \ GOTO 1820
1760 D1$=D$
1770 FOR I=1 TO LEN(D1$)
1780 IF D1$(I,I)<>" " THEN D1$(I,I)="*"
1790 IF I>LEN(D$)-2 THEN 1810
1800 IF D1$(I,I)<>" " THEN IF D1$(I+2,I+2)<>" " THEN D1$(I+1,I+1)="*"
1810 NEXT I
1820 WRITE #1 %175, D$,D1$,NOENDMARK
1830 CLOSE #1
1840 GOTO 960
1850 REM OPTION B STARTS HERE
1860 GOSUB 3790
1870 FILL 11544, 1
1880 !A$ \ !D$ \ !D1$ \ ! \ !
1890 S(0)=0
1900 FOR I=1 TO N1
1910   ! "ENTER ITEM FOR ALPHA FIELD #",I," ",
1920   !FNX$(S(I)+2,2*I+4),"<",
1930   !FNX$(1,2*I+4),
1940   INPUT C$
1950   IF LEN(C$)>=S(I) THEN 1960 \ C$=C$+" " \ GOTO 1950
1960   WRITE #1 %N4*R+S(0)+335, C$(1,S(I)),NOENDMARK
1970   S(0)=S(0)+S(I)+2
1980 NEXT I
1990 FOR I=1 TO N2
2000   ! "    ENTER NUMBER FOR NUMERIC FIELD #",I," ",
2010   INPUT X \ IF FNA(D(I),X)=0 THEN X=0
2020   IF FNA(D(I),X)=0 THEN X=0 \ IF D(I)=0 THEN 2030
2030   IF X=0 THEN 2100 \ IF ABS(X)>=1 THEN 2060
2040   IF F(I)-D(I)<=1 AND X<0 THEN 2090
2050   Y$=STR$(X) \ IF LEN(Y$)<=F(I)+1 THEN 2100 ELSE 2090
2060   Y=FNA(0,X) \ Y$=STR$(Y)
2070   IF D(I)=0 THEN IF X=INT(X) AND LEN(Y$)-1<=F(I) THEN 2100
2080   IF LEN(Y$)<=F(I)-D(I) THEN 2100
2090     GOSUB 3770 \ GOTO 2000
2100   WRITE #1 %N4*R+S(0)+335, X,NOENDMARK
2110   S(0)=S(0)+5
2120 NEXT I
2130 N4=N4+1
2140 !"DO YOU WANT TO ADD MORE DATA?" \ X$=INCHAR$(0)
2150 IF X$="Y" THEN 1880 \ IF X$="y" THEN 1880
2160 WRITE #1 %165, N4,NOENDMARK
2170 CLOSE #1
2180 FILL 11544, 0
2190 GOTO 960
2200 REM OPTION C STARTS HERE
2210 GOSUB 3790
2220 S(0)=0 \ F(0)=0
2230 REM CHOOSE FIELD TO BE DISPLAYED
2240 !\!"WHICH FIELD CONTAINS THE ITEM THAT YOU WANT TO CHANGE?"\!\!D$\!
2250 FOR I=1 TO N1
2260   !TAB(5),CHR$(I+64),") ALPHANUMERIC FIELD #",I
2270   S(0)=S(0)+S(I)+2
2280 NEXT I
2290 PRINT
2300 FOR I=1+N1 TO N2+N1
2310   !TAB(5),CHR$(I+64),") NUMERIC FIELD #",I-N1
2320 NEXT I
2330 X$=INCHAR$(0) \ Y=ASC(X$)-64 \ IF Y<1 OR Y>N1+N2 THEN 2220
2340 !\!\!"BE SURE TO MAKE A NOTE OF THE NUMBER OF THE RECORD THAT YOU"
2350 !"WANT TO CHANGE!!!!!" \ GOSUB 4050
2360 IF Y>N1 THEN 2500
2370 REM DISPLAYS STRING FIELD
2380 S(0)=0
2390 FOR I=1 TO Y-1
2400   S(0)=S(0)+S(I)+2
2410 NEXT I
2420 FOR K=1 TO N4
2430   READ #1 %(K-1)*R+335, C1$
2440   READ #1 %(K-1)*R+S(0)+335, C$ \ IF C1$=C$ THEN C$=""
2450   !K,TAB(5),C1$,"      ",C$
2460   IF K/17 = INT(K/17) THEN GOSUB 4050
2470 NEXT K
2480 GOTO 2590
2490 REM DISPLAY NUMERIC FIELD
2500 J=Y-N1
2510 M=S(0)+(J-1)*5
2520 FOR K=1 TO N4
2530   IF N1>0 THEN READ #1 %(K-1)*R+335, C$ ELSE C$=""
2540   READ #1 %(K-1)*R+M+335, X
2550   !K,TAB(5),C$,"      ",FNZ$(F(J),D(J),X),FNA(D(J),X),FNY$(D(J),X)
2560   IF K/17 = INT(K/17) THEN GOSUB 4050
2570 NEXT K
2580 REM DECIDE WHAT CHANGE TO MAKE IN DATA
2590 !\!"WHICH DO YOU WANT TO DO?"
2600 !TAB(5),"A) REPLACE AN ITEM WITH A NEW ENTRY"
2610 !TAB(5),"B) DELETE AN ENTIRE RECORD FROM THE DATA FILE"
2620 !TAB(5),"C) RETURN TO MENU WITHOUT MAKING CHANGES"\!
2630 X$=INCHAR$(0) \ Y1=ASC(X$)-64 \ IF Y1<1 OR Y1>3 THEN 2590
2640 !A$ \ ON Y1 GOTO 2650, 2910, 3090
2650 IF Y>N1 THEN 2770
2660 REM CHANGE ITEM IN ALPHA FIELD
2670 INPUT "ENTER THE NUMBER OF THE RECORD TO BE CHANGED ",K
2680 IF K>0 AND K<=N4 AND K=INT(K) THEN 2690\ ! \ GOSUB 3770 \ ! \ GOTO 2670
2690 !\!"ENTER THE NEW STRING TO BE SUBSTITUTED IN THE DATA FILE"
2700   !FNX$(S(Y)+2,5),"<",
2710   !FNX$(1,5),
2720 INPUT C$
2730   IF LEN(C$)>=S(Y) THEN 2740 \ C$=C$+" " \ GOTO 2730
2740 WRITE #1 %(K-1)*R+S(0)+335, C$,NOENDMARK
2750 GOTO 3090
2760 REM CHANGE ITEM IN NUMERIC FIELD
2770 INPUT "ENTER THE NUMBER OF THE RECORD TO BE CHANGED ",K
2780 IF K>0 AND K<=N4 AND K=INT(K) THEN 2790\ ! \ GOSUB 3770 \ ! \ GOTO 2770
2790 INPUT "ENTER THE NEW VALUE TO BE SUBSTITUTED IN THE DATA FILE ",X
2800 IF FNA(D(J),X)=0 THEN X=0 \ IF D(J)=0 THEN 2810
2810 IF X=0 THEN 2880 \ IF ABS(X)>=1 THEN 2840
2820 IF F(J)-D(J)<=1 AND X<0 THEN 2870
2830 Y$=STR$(X) \ IF LEN(Y$)<=F(J)+1 THEN 2880 ELSE 2870
2840 Q=FNA(0,X) \ Y$=STR$(Q)
2850 IF D(J)=0 THEN IF X=INT(X) AND LEN(Y$)-1<=F(J) THEN 2880
2860 IF LEN(Y$)<=F(J)-D(J) THEN 2880
2870   ! \ GOSUB 3770 \ ! \ GOTO 2790
2880 WRITE #1 %(K-1)*R+M+335, X,NOENDMARK
2890 GOTO 3090
2900 REM DELETE A RECORD
2910 INPUT "ENTER THE NUMBER OF THE RECORD TO BE DELETED ",K
2920 IF K=N4 THEN 3080
2930 FILL 11544, 1
2940 FOR I=K TO N4-1
2950   S(0)=0
2960   FOR J=1 TO N1
2970     READ #1 %I*R+S(0)+335, C$
2980     WRITE #1 %(I-1)*R+S(0)+335, C$,NOENDMARK
2990     S(0)=S(0)+S(J)+2
3000   NEXT J
3010   FOR J=1 TO N2
3020     READ #1 %I*R+S(0)+335, X
3030     WRITE #1 %(I-1)*R+S(0)+335, X,NOENDMARK
3040     S(0)=S(0)+5
3050   NEXT J
3060 NEXT I
3070 FILL 11544, 0
3080 WRITE #1 %165, N4-1,NOENDMARK
3090 CLOSE #1
3100 GOTO 960
3110 REM OPTION D STARTS HERE
3120 !"DO YOU WANT HARD COPY? ", \ X$=INCHAR$(0) \ !X$ \ !
3130 IF X$="Y" THEN P2=1 ELSE P2=0
```

More →

Listing 1 continued.

```
3140 GOSUB 3790 \ !A$ \ !#P2 \ !#P2 D$ \ !#P2 D1$ \ !#P2
3150 S(0)=0 \ F(0)=0 \ T=0
3160 FOR I=1 TO N1 \ S(0)=S(0)+S(I) \ NEXT I
3170 FOR I=1 TO N2 \ F(0)=F(0)+F(I)+1 \ G(I)=0 \ NEXT I
3180 REM CALCULATES SPACES BETWEEN COLUMNS
3190 T=(L1-(S(0)+F(0)))/(N1+N2) \ T=INT(T)
3200 FOR I=1 TO N4
3210   S(0)=0
3220   FOR J=1 TO N1
3230     READ #1 %(I-1)*R+335+S(0), C$
3240     !#P2 C$,
3250     S(0)=S(0)+S(J)+2
3260     FOR K=1 TO T \ !#P2" ", \ NEXT K
3270   NEXT J
3280   FOR J=1 TO N2
3290     READ #1 %(I-1)*R+335+S(0), X
3300     !#P2  FNZ$(F(J),D(J),X),FNA(D(J),X),FNY$(D(J),X),
3310     S(0)=S(0)+5 \ G(J)=G(J)+X
3320     FOR K=1 TO T \ !#P2" ", \ NEXT K
3330   NEXT J
3340   PRINT #P2
3350   IF P2=0 THEN IF I/19=INT(I/19) THEN GOSUB 4050
3360 NEXT I
3370 CLOSE #1 \ IF N2<=0 THEN 3470
3380 !\!"DO YOU WANT TOTALS AND AVERAGES FOR NUMERIC COLUMNS?  ",
3390 X$=INCHAR$(0) \ !X$ \ IF X$<>"Y" THEN 3470 \ !A$
3400 FOR I=1 TO N2
3410   !#P2
3420   IF P2>0 THEN 3440 \ IF I<>8 THEN 3440
3430     INPUT "PRESS RETURN TO CONTINUE. ",Z$ \ !A$
3440   !#P2 "TOTAL FOR NUMERIC COLUMN",I," IS",TAB(35),G(I)
3450   !#P2 "AVERAGE FOR NUMERIC COLUMN",I," IS",TAB(35),G(I)/N4
3460 NEXT I
3470 IF P2=1 THEN !#P2 CHR$(12)
3480 !\INPUT "PRESS RETURN TO CONTINUE.  ",Z$
3490 GOTO 960

3500 REM OPTION E STARTS HERE
3510 GOSUB 3790 \ ! \ ! \ !D$ \ !D1$
3520 IF N1=0 THEN 3580
3530 !\!"NUMBER OF ALPHANUMERIC FIELDS IS",N1
3540 !TAB(5),"NUMBER OF CHARACTERS IN EACH ALPHA FIELD IS-"
3550 FOR I=1 TO N1
3560   !TAB(10),%2I,I,"   ",S(I)
3570 NEXT I \ ! \ INPUT "PRESS RETURN TO CONTINUE. ",Z$ \ !A$
3580 IF N2=0 THEN 3640
3590 !\!"NUMBER OF NUMERIC FIELDS IS",N2 \ !
3600 !TAB(5),"FOR EACH FIELD-   # OF CHAR      PLACES TO RT OF DECIMAL"

3610 FOR I=1 TO N2
3620   !%12I,TAB(1),I,TAB(18),F(I),TAB(37),D(I)
3630 NEXT I \ !
3640 !"NUMBER OF BYTES PER RECORD IS",R \ !
3650 !"NUMBER OF RECORDS IN THE FILE IS",N4 \ !
3660 CLOSE #1
3670 !\INPUT "PRESS RETURN TO CONTINUE.  ",Z$ \ !A$
3680 GOTO 960
3690 REM OPTION H STARTS HERE

3700 GOSUB 3790 \ S(0)=0 \ F(0)=0
3710 FOR I=1 TO N1 \ S(0)=S(0)+S(I) \ NEXT I
3720 FOR I=1 TO N2 \ F(0)=F(0)+F(I) \ NEXT I
3730 T=(L1-(S(0)+F(0)+N2))/(N1+N2) \ T=INT(T)
3740 !A$ \ !FNX$(1,23),D$, \ !FNX$(1,24),D1$, \ !FNX$(1,2),
3750 GOTO 1480
3760 REM *** INPUT ERROR SUBROUTINE ***
3770 !CHR$(7)\!"INPUT ERROR.  PLEASE TRY AGAIN." \ RETURN
3780 REM *** SUBROUTINE FOR READING PARAMETERS FROM FIRST RECORD ***
3790 INPUT "ENTER NAME OF DATA FILE: ",B$
```

More

Listing 1 continued.

```
3795 IF B$<>"" THEN 3799 \ B$=B1$ \ !B$ \ GOTO 3800
3799 CLOSE #1 \ B1$=B$
3800 OPEN #1%12, B$
3810 READ #1, N1
3820 FOR I=1 TO N1
3830   READ #1, S(I)
3840 NEXT I
3850 READ #1 %55, N2
3860 FOR I=1 TO N2
3870   READ #1, F(I)
3880 NEXT I
3890 FOR I=1 TO N2
3900   READ #1 %110+(I-1)*5, D(I)
3910 NEXT I
3920 READ #1 %160, R,N4
3930 READ #1 %175, D$,D1$
3940 RETURN
3950 REM *** ERRSET SUBROUTINE ***
3960 !CHR$(7)\IF E2<>7 AND E2<>4 THEN 4020
3970 IF X4<>1 THEN 4000
3980 !\!"THIS FILE ALREADY EXISTS OR THE DISK IS TOO FULL FOR A NEW FILE."
3990 !"PLEASE START OVER."\!\GOTO 1110
4000 ERRSET 3960,E1,E2
4010 GOSUB 3770 \ GOTO 3790
4020 !\!"ERROR NO.",E2," IN LINE",E1," OF THIS PROGRAM."
4030 END
4040 REM *** END OF CRT PAGE SUBROUTINE ***
4050 !\INPUT "PRESS RETURN TO CONTINUE. ",L$
4060 !A$ \ !D$ \ !D1$ \ ! \ RETURN
```

Fig. 2. DATAKEEP display of all data—menu item D.

LAST NAME	FIRST NAME	STREET ADDRESS	NO.1	NO.2	NO.3
*********	**********	**********	****	****	****
BENEDICT	KIRK	210 NORTH 118TH STREET	22.000	23.0	.10
STEELE	ANDREA	234 NORTH 77TH STREET	3.456	2.3	90.00
GARDNER	NORBERT H.	9200 KINGSHIGHWAY NORTH	15.670	14.0	.60
ZLOMKE	ANN M.	3300 HUNTINGTON, #19	2.999	30.0	3.00
KAMBAH	GREGORY	34 HILLCREST AVENUE	.030	.1	1.20
BANGHART	HARRIETT	4399 PLEASANT STREET	.001	.1	.09
McGOVERN	ALBERT	506 NORTH 90TH STREET	0.000	7.0	5.00
MONTANA	WILLIAM G.	34 ROSE GARDEN LANE	.200	.3	96.00
JAMES	NORA	3344 NORTHVIEW PLAZA	99.900	99.9	99.99
ROBBINS	MICKEY	348 SO. 87TH ST. -APT.4	7.330	6.3	20.10
DEARBORN	MARGARET	99 SUNNYVIEW TERRACE	4.300	4.3	4.30
ARNOLD	PAUL B.	48 NORTH 108TH CIRCLE	12.000	12.0	12.00
LONG	RICHARD	606 NORTH 44TH STREET	.800	35.4	90.00
SUNDERMANN	GALE	487 HARNEY STREET	34.500	.2	56.00
BURKE	ABIGAL D.	430 ROCKBROOK LANE	1.100	69.0	12.00
UNDERWOOD	RONALD	555 SUNBURST PLACE	3.760	43.0	.45
ANDERSON	WALLACE	632 FARNAM STREET	4.000	12.0	93.00
MODELL	JANIFER	72 SOUTH 123RD STREET	38.000	38.0	.03
CHEESEBORO	HARLAN	54 PINE STREET, APT. #6	.040	32.8	3.21
FISCHER	STEVEN	7074 KINGS HIGHWAY NORTH	50.321	.4	.02
McDONALD	BRIDGETT	4022 SOUTH 45TH AVENUE	.002	3.0	73.21
JACKSON	KIMBERLY	3384 MELANO PARK ROAD	21.540	32.0	3.20
OWENS	MARY	466 SOUTH 56TH STREET	6.200	18.3	-8.77
SANYO	SAMUEL E.	74 NORTH 77TH STREET	80.325	42.0	7.32
NORTH	JACK	1230 MASON ROAD - RR # 7	18.000	63.0	4.00
RODGERS	MILLIE	8032 NORTH 188TH STREET	1.110	22.2	.02
DEIMLING	MICHAEL	3245 WATERMELON PARKWAY	-5.300	0.0	0.00

More

Fig. 2 continued.

```
JOHNSON        WILMA        445 MADSON                      4.300     .2     9.00
WILKINSON      DEAN         663 NORTH 33 AVENUE            77.000    4.4    44.00
MITCHELL       GARY         5566 RONDUE PLACE - APT.3      44.500   99.0    10.30

DO YOU WANT TOTALS AND AVERAGES FOR NUMERIC COLUMNS?
```

Listing 2. DATASORT program.

```
100 REM PROGRAM TITLE- DATASORT REVISION 3.3
110 REM COPYRIGHT BY KIRK BENEDICT, JUNE 27, 1980
120 REM
130 REM                        IDENTITY OF SOME VARIABLES
140 REM       A$   = CLEAR SCREEN
150 REM       B$   = NAME OF EXISTING FILE
160 REM       B1$  = NAME OF NEW FILE
170 REM     E$,E   = INPUT FOR SEARCH
180 REM  G$,U( )   = HOLDS DATA (READ FROM FIELD) FOR SORTING
190 REM        H   = NUMBER OF ITEMS >= THAN ONE BEING SORTED
200 REM    I,J,K   = LOOP COUNTERS
210 REM       N4   = NUMBER OF RECORDS IN THE FILE
220 REM       N5   = SIZE OF FILE (BLOCKS)
230 REM       R    = NUMBER BYTES PER RECORD
240 REM    S(0),M  = BYTES IN RECORD PRECEDING FIELD BEING EXAMINED
250 REM      X,C   = DATA FROM FIELD Y
260 REM       Y    = FIELD OF DATABASE TO BE SORTED OR SEARCHED
270 REM     W( )   = NUMBERS FOR ORDER IN WHICH RECORDS ARE PRINTED
280 REM
290 REM       X1$ - "Y" = HARD COPY
300 REM       X2$ - "Y" = WRITE A NEW FILE
310 REM       X3$ - "A" = SORT, "B" = SEARCH
320 REM       X4$ - "A" = FASTSORT, "B" = ORDERED SORT
330 REM
340 DEF FNX$(X,Y)=CHR$(27)+"="+CHR$(Y+31)+CHR$(X+31)
350 A$=CHR$(27)+CHR$(43)\!A$
360 GOSUB 1720
370 ! \ !"DO YOU WANT TO-"
380 !"      A) SORT DATA IN FILE?"
390 !"      B) SEARCH FOR A SPECIFIC RECORD?"
400 !"      C) RETURN TO MENU?"
410 X3$=INCHAR$(0) \ IF X3$="A" THEN 430 \ IF X3$="B" THEN 470
420 IF X3$="C" THEN CHAIN "DATAKEEP" \!\GOTO 370
430 ! \ !"DO YOU WANT-"
440 !"      A) FAST SORT"
450 !"      B) ORDERED SORT"
460 X4$=INCHAR$(0) \ IF X4$="A" THEN 470 \ IF X4$="B" THEN 470 \ GOTO 430
470 IF X3$="A" THEN F$="SORTED" ELSE F$="SEARCHED"
480 ERRSET 2060,E1,E2
490 !\! "ENTER NAME OF DATA FILE TO BE ",F$,": ",\INPUT B$
500 OPEN #1%12, B$,N5
510 !\!"DO YOU WANT HARD COPY? ",
520 X1$=INCHAR$(0) \ IF X1$="Y" THEN P2=1 \ !X1$
530 !"DO YOU WANT A DATA FILE WRITTEN AFTER THE DATA IS ",F$,"? ",
540 X2$=INCHAR$(0) \ !X2$ \ IF X2$<>"Y" THEN 580
550 INPUT "ENTER THE NAME OF THE NEW DATA FILE: ",B1$
560 CREATE B1$,N5,12
570 OPEN #2%12, B1$
580 READ #1, N1
590 IF X2$="Y" THEN WRITE #2, N1,NOENDMARK
600 FOR I=1 TO N1
610   READ #1, S(I)
620   IF X2$="Y" THEN WRITE #2, S(I),NOENDMARK
630 NEXT I
640 READ #1 %55, N2
650 IF X2$="Y" THEN WRITE #2 %55, N2,NOENDMARK
660 FOR I=1 TO N2
670   READ #1, F(I)
680   IF X2$="Y" THEN WRITE #2, F(I),NOENDMARK
690 NEXT I
700 FOR I=1 TO N2
710   READ #1 %110+(I-1)*5, D(I)
720   IF X2$="Y" THEN WRITE #2 %110+(I-1)*5, D(I),NOENDMARK
730 NEXT I
740 READ #1 %160, R,N4,X
750 IF X2$="Y" THEN WRITE #2 %160, R,N4,X,NOENDMARK
760 DIM C$(75),E$(75),W(N4),D$(78),D1$(78)
770 READ #1%175, D$,D1$
780 IF X2$="Y" THEN WRITE #2 %175, D$,D1$,NOENDMARK
790 IF X3$="A" THEN 810
800   INPUT "ENTER ITEM YOU WANT TO FIND: ",E$
810 S(0)=0 \ F(0)=0
820 REM CHOOSE FIELD TO BE SORTED
830 !\!"WHICH FIELD IS TO BE ",F$,"?" \ ! \ !D$ \ !
840 FOR I=1 TO N1
850   !TAB(5),CHR$(I+64),") ALPHANUMBERIC FIELD #",I
860   S(0)=S(0)+S(I)+2
870 NEXT I
880 PRINT
890 FOR I=1+N1 TO N2+N1
900   !TAB(5),CHR$(I+64),") NUMBERIC FIELD #",I-N1
910 NEXT I
920 X$=INCHAR$(0) \ Y=ASC(X$)-64 \ IF Y<1 OR Y>N1+N2 THEN 810 \ !A$
930 !FNX$(34,11),"READING DATA"
940 IF Y>N1 THEN 1190
950 REM READS STRING FIELD
960 IF X3$="B" THEN 970 \ DIM G$(S(Y)*N4), T$(S(Y)*N4) \ GOTO 980
970 IF LEN(E$)>S(Y) THEN E$=E$(1,S(Y))
980 S(0)=0
990 FOR I=1 TO Y-1
1000   S(0)=S(0)+S(I)+2
1010 NEXT I
1020 FOR K=1 TO N4
1030   READ #1 %(K-1)*R+S(0)+335, C$
1040   IF X3$="A" THEN 1090
1050   REM SEARCH
1060   IF E$<>C$(1,LEN(E$)) THEN 1100
1070   P=P+1 \ W(P)=K \ GOTO 1100
1080   REM FOR SORT
1090   G$((K-1)*S(Y)+1,K*S(Y))=C$
1100   !FNX$(38,12),K
1110 NEXT K \ IF X3$="A" THEN 1130
1120   N4=P \ GOTO 1350
1130 !FNX$(34,11),"SORTING DATA"
1140 !FNX$(38,12),"    "
1150 REM SORTS STRINGS
1160 IF X4$="A" THEN GOSUB 2350 ELSE GOSUB 2140
1170 GOTO 1350
1180 REM READS NUMERIC FIELD
1190 IF X3$="A" THEN 1200 \ E=VAL(E$) \ GOTO 1210
1200 DIM U(N4)
1210 J=Y-N1
1220 M=S(0)+(J-1)*5
1230 FOR I=1 TO N4
1240   READ #1 %(I-1)*R+M+335, X
1250   IF X<>E THEN IF X3$="A" THEN 1270 ELSE 1280
1260   P=P+1 \ W(P)=I \ GOTO 1280
1270   U(I)=X
1280   !FNX$(38,12),I
1290 NEXT I \ IF X3$="A" THEN 1310 \ N4=P \ GOTO 1350
1300 REM SORTS NUMBERS
1310 !FNX$(34,11),"SORTING DATA"
1320 !FNX$(38,12),"    "
1330 IF X4$="A" THEN GOSUB 2460 ELSE GOSUB 2250
1340 REM PRINTS RECORDS
```

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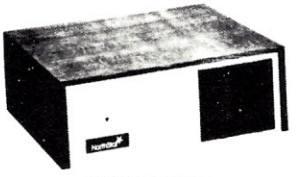

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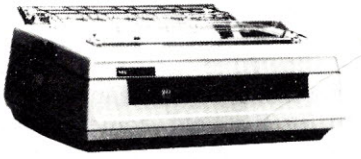

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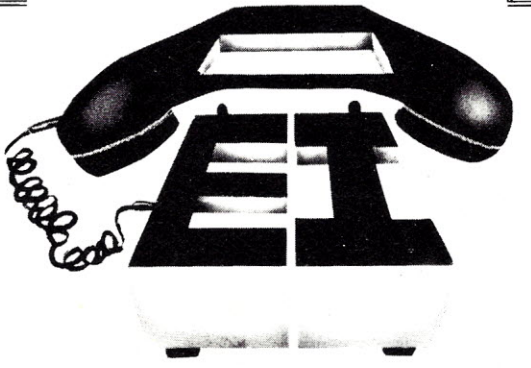

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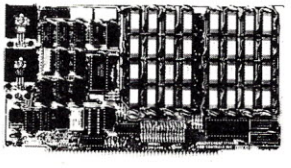

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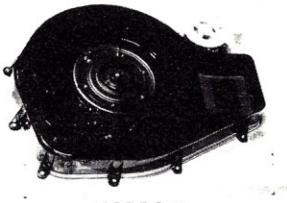

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left of the decimal point. Negative numbers and zero cannot be entered in a field where no space has been reserved to the left of the decimal point.

Lines 1310 through 1360 will keep you from designing a database that is so large it does not have at least one space between each of the columns. If this criterion is satisfied, you will be asked to supply labels for each of the fields you have created. You will not be allowed to enter a label which has more characters than were reserved for the field, something you should keep in mind when you specify the width of each field. Labels may be revised by using option H.

The parameters which describe each of the databases are written in the first 335 bytes of the data file. These parameters can be examined by executing program option F. Option F provides information which would make it relatively easy to write a special applications program that uses data in any of the fields. The data can be read by the statement:

READ #1%(I−1)*R+335+X,

where I is the number of the record being read, R is the number of bytes in each record, and X is the total number of bytes in the preceding fields (five bytes for each numeric field plus two bytes for each alphanumeric field plus the total number of characters in each alphanumeric field).

Information is placed in the database with option B. The maximum length of each of the alphanumeric entries is indicated on the screen when you request input for these fields (lines 1920 through 1930). Numeric input is restricted to that which has been specified for a given field by lines 2010 through 2090. Each new entry is added to the end of the existing data file initially. Sorting can be done with option G to rearrange the records in any desirable order.

The contents of the database are displayed with option D (see Fig. 2). After the entire database has been displayed or printed, you can request totals and averages for the numeric fields.

Two functions are used to format the output of data in the numeric fields. FNZ$ (lines 600 through 750) is used to right justify numeric output by determining the number of spaces that should be printed before each number. FNA (line 770) rounds the number to the desired number of decimal places, and FNY$ (lines 790

Listing 2 continued.

```
1350 S(0)=0 \ F(0)=0
1360 FOR I=1 TO N1 \ S(0)=S(0)+S(I) \ NEXT I
1370 FOR I=1 TO N2 \ F(0)=F(0)+F(I)+1 \ NEXT I
1380 REM CALCULATES SPACES BETWEEN COLUMNS
1390 T=(79-(S(0)+F(0)))/(N1+N2) \ T=INT(T) \ !A$
1400 IF P2<>1 THEN 1420
1410 FOR I=1 TO 5 \ PRINT #P2 \ NEXT I
1420 IF X2$="Y" THEN FILL 11544, 1
1430 !#P2 D$ \ !#P2 D1$ \ !#P2
1440 FOR H=1 TO N4
1450   S(0)=0
1460   FOR J=1 TO N1
1470     READ #1 %((W(H)-1)*R)+S(0)+335, C$
1480     IF X2$="Y" THEN WRITE #2 %(H-1)*R+S(0)+335, C$,NOENDMARK
1490     !#P2 C$,
1500     S(0)=S(0)+S(J)+2
1510     FOR K=1 TO T \ !#P2" ", \ NEXT K
1520   NEXT J
1530   FOR J=1 TO N2
1540     READ #1 %((W(H)-1)*R)+S(0)+335, X
1550     IF X2$="Y" THEN WRITE #2 %(H-1)*R+S(0)+335, X,NOENDMARK
1560     !#P2 FNZ$(F(J),D(J),X),FNA(D(J),X),FNY$(D(J),X),
1570     S(0)=S(0)+5
1580     FOR K=1 TO T \ !#P2" ", \ NEXT K
1590   NEXT J
1600   PRINT #P2
1610 IF P2=0 THEN IF H/19=INT(H/19) THEN GOSUB 2110
1620 NEXT H
1630 IF X2$="Y" THEN IF X3$="B" THEN WRITE #2 %165, N4,NOENDMARK
1640 FILL 11544, 0
1650 IF N4=0 THEN ! CHR$(7),"NO ITEMS IN THIS FIELD MATCH THE INPUT!"
1660 IF P2=1 THEN !#1 CHR$(12)
1670 CLOSE #1 \ CLOSE #2
1680 !\INPUT "PRESS RETURN TO CONTINUE.  ",Z$
1690 CHAIN "DATAKEEP"
1700 REM FUNCTIONS FOR FORMATTING NUMERIC OUTPUT USING VARIABLES
1710 REM RIGHT JUSTIFY BY PUTTING SPACE IN FRONT OF SMALL NUMBERS
1720 DEF FNZ$(A,B,X)
1730   Z=A-(B+1)
1740   IF B=0 AND X=0 THEN 1800 \ IF X<=0 THEN Z=Z-1 \ IF X=0 THEN 1800
1750   IF B=0 THEN IF X<0 THEN Z=A-1 ELSE Z=A
1760   IF X<0 AND X>-1 THEN Z=Z+1
1770   FOR L=0 TO 6
1780     IF ABS(INT(X))>=10^L AND ABS(INT(X))<10^(L+1) THEN Z=Z-(L+1)
1790   NEXT L
1800   Z$=CHR$(0)
1810   FOR L=1 TO Z
1820     Z$=Z$+" "
1830   NEXT L
1840   RETURN Z$
1850   FNEND
1860 REM ROUND NUMBER TO SPECIFIED NUMBER OF DECIMAL PLACES
1870 DEF FNA(B,X)=INT(X*10^B)/10^B
1880 REM ADD TRAILING ZEROS
1890 DEF FNY$(B,X)
1900   Z$=CHR$(0)
1910   Z=INT(X*10^B)/10^B
1920   Y3=Z-INT(Z)
1930   IF Y3>0 THEN 1960
1940     Z$="." \ IF B=0 THEN Z$=CHR$(0)
1950     V=B \ GOTO 1990
1960   Y$=STR$(Y3)
1970   L=LEN(Y$)-2
1980   V=B-L
1990   FOR P=1 TO V
2000     Z$=Z$+"0"
2010   NEXT P
2020   RETURN Z$
2030   FNEND
2040 RETURN
2050 REM *** ERRSET SUBROUTINE ***
2060 !CHR$(7)\IF E2=12 THEN 2090\IF E2<>7 AND E2<>4 THEN 2080
2070 !"FILE ERROR!  PLEASE TRY AGAIN!" \ GOTO 480
2080 !\!"ERROR NO.",E2," IN LINE",E1," OF THIS PROGRAM."\END
2090 !A$\!"NON-NUMERIC INPUT! PLEASE TRY AGAIN!"\!\GOTO 800
2100 REM *** SUBROUTINE FOR BOTTOM OF CRT PAGE ***
2110 !\INPUT "PRESS RETURN TO CONTINUE. ",L$
2120 !A$ \ !D$ \ !D1$ \ ! \ RETURN
2130 REM *** SLOW & ORDERED SORT FOR STRINGS ***
2140 FOR I=1 TO N4
2150   H=1
2160   FOR J=1 TO N4
2170     IF G$((I-1)*S(Y)+1,I*S(Y))>G$((J-1)*S(Y)+1,J*S(Y)) THEN H=H+1
2180     IF G$((I-1)*S(Y)+1,I*S(Y))<>G$((J-1)*S(Y)+1,J*S(Y)) THEN 2200
2190     IF I>J THEN H=H+1
2200   NEXT J
2210   W(H)=I
2220 !FNX$(38,12),I
2230 NEXT I \ RETURN
2240 REM *** SLOW & ORDERED SORT FOR NUMBERS ***
2250 FOR I=1 TO N4
2260   H=1
2270   FOR J=1 TO N4
2280     IF U(I)>U(J) THEN H=H+1
2290     IF U(I)=U(J) AND I>J THEN H=H+1
2300   NEXT J
2310   W(H)=I
2320 !FNX$(38,12),I
```

More →

Listing 2 continued.

```
2330 NEXT I \ RETURN
2340 REM *** SHELL-METZNER SORT FOR STRINGS ***
2350 FOR I7=1 TO N4 \ W(I7)=I7 \ NEXT I7
2360 M7=N4
2370 M7=INT(M7/2) \ !FNX$(38,12),%4I, M7
2380 IF M7=0 THEN RETURN \ K7=N4-M7 \ J7=1
2390 I7=J7
2400 L7=I7+M7
2410 A7=(I7-1)*S(Y)+1 \ B7=I7*S(Y) \ C7=(L7-1)*S(Y)+1 \ D7=L7*S(Y)
2420 IF G$(A7,B7)<=G$(C7,D7) THEN 2450
2430 T$=G$(A7,B7) \ G$(A7,B7)=G$(C7,D7) \ G$(C7,D7)=T$
2440 T7=W(I7) \ W(I7)=W(L7) \ W(L7)=T7 \ I7=I7-M7 \ IF I7>=1 THEN 2400
2450 J7=J7+1 \ IF J7>K7 THEN 2370 ELSE 2390
2460 REM *** SHELL-METZNER SORT FOR NUMBERS ***
2470 FOR I7=1 TO N4 \ W(I7)=I7 \ NEXT I7
2480 M7=N4
2490 M7=INT(M7/2) \ !FNX$(38,12),%4I, M7
2500 IF M7=0 THEN RETURN \ K7=N4-M7 \ J7=1
2510 I7=J7
2520 L7=I7+M7
2530 IF U(I7)<=U(L7) THEN 2560
2540 T7=U(I7) \ U(I7)=U(L7) \ U(L7)=T7
2550 T7=W(I7) \ W(I7)=W(L7) \ W(L7)=T7 \ I7=I7-M7 \ IF I7>=1 THEN 2520
2560 J7=J7+1 \ IF J7>K7 THEN 2490 ELSE 2510
```

Fig. 3. Sample file sorted by numeric field Number 2 using DATASORT.

LAST NAME	FIRST NAME	STREET ADDRESS	NO.1	NO.2	NO.3
*********	**********	**************	****	****	****
DEIMLING	MICHAEL	3245 WATERMELON PARKWAY	-5.300	0.0	0.00
KAMBAH	GREGORY	34 HILLCREST AVENUE	.030	.1	1.20
BANGHART	HARRIETT	4399 PLEASANT STREET	.001	.1	.09
SUNDERMANN	GALE	487 HARNEY STREET	34.500	.2	56.00
JOHNSON	WILMA	445 MADSON	4.300	.2	9.00

More →

through 930) determines the number of trailing zeros which should be added to each number.

Note that the alphanumeric fields are always printed prior to the numeric fields, and the fields are always printed or displayed in the order in which they were created.

Changes in the database are made with option C. You must indicate the field in which the change is to be made. (The selection of a field is not significant if you wish to delete an entire record from the database.) You will be shown the entry in the first alphanumeric field (if there is one) and the entry in the field which is to be changed for each record. Each record is numbered as it is being displayed, so that the operator can make a note of the number of the record which he wants to change. The operator may then make a new entry, delete an entire record or return to the menu of options without making any changes.

A carriage return may be used to select a default response to inquiries in the program. A carriage return selects option D of the menu. The default response also eliminates the necessity of entering the name of the

data file again when another option is selected. A carriage return may be substituted for a negative response to other inquiries in the program.

DATASORT

The DATASORT program (Listing 2) can be used to sort the database or to look for a specific entry in one of the fields. The database can be written into a new disk file after it has been sorted. Likewise, all of the records from the database that are found after a search for a specific item can be written into a new data file. Hard copy can be printed (see Fig. 3) whether a new disk file is being created or not.

There are instances when you might want to sort by more than one field. In maintaining a list of club members, for example, you might want an alphabetical list of all of the members in a certain membership category. First, sort the entire file alphabetically and write the records into a new data file. Now sort the second file, using the field which contains the membership category. (If you want a separate list or file for each membership category, you can search the field for records that are in a certain category after it has been sorted alphabetically.)

Since the original sorting technique used in the program was terribly slow when there was a large number of records, a *fast-sort* option has been included, which employs a Shell-Metzner sort. Unfortunately, the Shell-Metzner sort does not retain the order given to a file by a previous sort. In the example above, a sort of the field that contains membership categories will not be in alphabetical order if the fast-sort option is used.

During a search for a string, the program matches the input against the same number of characters in the field being searched. If you enter the word auto, for example, the records containing the words "automobile" and "automatic" are displayed in addition to those that exactly match the input.

When searching or sorting is completed, a CHAIN statement loads and executes the DATAKEEP program, returning the operator to the menu of options.

DATAMAIL

DATAMAIL (Listing 3) prints mailing labels from a database. The remarks at the beginning of this program show the information that should be placed in each of the alpha-

Fig. 3 continued.

MONTANA	WILLIAM G.	34 ROSE GARDEN LANE	.200	.3	96.00
FISCHER	STEVEN	7074 KINGS HIGHWAY NORTH	50.321	.4	.02
STEELE	ANDREA	234 NORTH 77TH STREET	3.456	2.3	90.00
McDONALD	BRIDGETT	4022 SOUTH 45TH AVENUE	.002	3.0	73.21
DEARBORN	MARGARET	99 SUNNYVIEW TERRACE	4.300	4.3	4.30
WILKINSON	DEAN	663 NORTH 33 AVENUE	77.000	4.4	44.00
ROBBINS	MICKEY	348 SO. 87TH ST. -APT.4	7.330	6.3	20.10
McGOVERN	ALBERT	506 NORTH 90TH STREET	0.000	7.0	5.00
ARNOLD	PAUL B.	48 NORTH 108TH CIRCLE	12.000	12.0	12.00
ANDERSON	WALLACE	632 FARNAM STREET	4.000	12.0	93.00
GARDNER	NORBERT H.	9200 KINGSHIGHWAY NORTH	15.670	14.0	.60
OWENS	MARY	466 SOUTH 56TH STREET	6.200	18.3	-8.77
RODGERS	MILLIE	8032 NORTH 188TH STREET	1.110	22.2	.02
BENEDICT	KIRK	210 NORTH 118TH STREET	22.000	23.0	.10
ZLOMKE	ANN M.	3300 HUNTINGTON, #19	2.999	30.0	3.00
JACKSON	KIMBERLY	3384 MELANO PARK ROAD	21.540	32.0	3.20
CHEESEBORO	HARLAN	54 PINE STREET, APT. #6	.040	32.8	3.21
LONG	RICHARD	606 NORTH 44TH STREET	.800	35.4	90.00
MODELL	JANIFER	72 SOUTH 123RD STREET	38.000	38.0	.03
SANYO	SAMUEL E.	74 NORTH 77TH STREET	80.325	42.0	7.32
UNDERWOOD	RONALD	555 SUNBURST PLACE	3.760	43.0	.45
NORTH	JACK	1230 MASON ROAD - RR # 7	18.000	63.0	4.00
BURKE	ABIGAL D.	430 ROCKBROOK LANE	1.100	69.0	12.00
MITCHELL	GARY	5566 RONDUE PLACE - APT.3	44.500	99.0	10.30
JAMES	NORA	3344 NORTHVIEW PLAZA	99.900	99.9	99.99

```
DONALD ALBRIGHT
TRIPARTITE COMM
8602 CUMING STREET
OMAHA        NE   68114

WILLIAM CARROLL
TRIPARTITE COMM
824 CENTRAL
NEBR CITY    NE   68410

KAREN FAIRCHILD
TRIPARTITE COMM
3223 E. PERSHING RD.
LINCOLN      NE   68502

KAREN GARD
TRIPARTITE COMM
1502 SOUTH 42ND ST.
OMAHA        NE   68105

JOHN JOHNSON
TRIPARTITE COMM
1502 SOUTH 42ND ST.
OMAHA        NE   68005

FRANCES SCHNEIDER
TRIPARTITE COMM
5110 125TH COURT
OMAHA        NE   68137

L. KIRK BENEDICT
TRIPARTITE COMM
210 NORTH 118TH ST.
OMAHA        NE   68154

BRUCE CLAYTON
COL OF PHARMACY
42ND & DEWEY AVE.
OMAHA        NE   68105

JOHN FISHER
TRIPARTITE COMM

VALENTINE    NE

PAMELA GIROUX
TRIPARTITE COMM
2138 SOUTH 84TH ST.
OMAHA        NE

ROBERT MARSHALL
NEBR PHAR ASSOC
1001 ANDERSON BLDG.
LINCOLN      NE   68500
```

Fig. 4. Format of labels produced by DATAMAIL.

Listing 3. DATAMAIL program.

```
100 !"PROGRAM TITLE: DATAMAIL"
110 !"**********************" \ !
120 REM FOR MAKING MAILING LABELS FROM DATABASE
130 REM THE DATABASE MUST HAVE THE FOLLOWING ALPHANUMERIC FIELDS
140 REM       1- LAST NAME (A1$ - 10)
150 REM       2- FIRST NAME (B1$ - 10)
160 REM       3- TITLE OR COMPANY (C1$ - 15)
170 REM       4- STREET ADDRESS (E1$ - 20)
180 REM       5- CITY (D1$ - 10)
190 REM       6- STATE ABBREVIATION (F1$ - 2)
200 REM       7- ZIP CODE (ENTERED AS STRING) (G1$ - 5)
210 REM
220 REM            IDENTIFICATION OF SOME VARIABLES
230 REM     B$ = NAME OF FILE
240 REM     N1 = NUMBER OF ALPHANUMERIC FIELDS IN DATABASE
250 REM     N4 = NUMBER OF RECORDS IN DATABASE
```

More

Listing 3 continued.

```
260 REM
270 DEF FNV$(L$,L)
280   FOR K=L TO 1 STEP -1
290     IF L$<>"" THEN 320
300       L$=" "
310       EXIT 350
320     IF L$(K,K)<>" " THEN EXIT 340
330   NEXT K
340   L$=L$(1,K)+" "
350   RETURN L$
360   FNEND
370 !"LABELS ON FORMS SHOULD BE IN PRINTER BEFORE STARTING."
380 !"POSITION TO START PRINTING ON FIRST LINE OF LABEL."
390 !"PERFORATION SKIP OVERRIDE (PIN SWITCH #7) SHOULD BE ON." \ !
400 INPUT "ENTER THE NAME OF THE FILE: ",B$
410 OPEN #1%12,B$
420 READ #1, N1
430 IF N1>=6 THEN 480
440    !CHR$(7)
450    !"ERROR. THIS FILE DOES NOT CONTAIN ADDRESSES!"
460    CLOSE #1
470    ! \ GOTO 400
480 INPUT "HOW MANY SETS OF MAILING LABELS DO YOU WANT PRINTED? ",N
490 IF N>10 OR N<1 OR N<>INT(N) THEN N=1
500 FOR I=1 TO N1
510   READ #1, S(I)
520 NEXT I
530 DIM A1$(S(1)),B1$(S(2)),C1$(S(3)),D1$(S(4)),E1$(S(5)),F1$(S(6)),G1$(S(7))
540 DIM A2$(S(1)),B2$(S(2)),C2$(S(3)),D2$(S(4)),E2$(S(5)),F2$(S(6)),G2$(S(7))
550 DIM L$(S(2))
560 READ #1%160, R,N4
570 IF N4/2=INT(N4/2) THEN E=N4-1 ELSE E=N4
580 FOR I=1 TO N
590   FOR J=1 TO E STEP 2
600     READ #1%(J-1)*R+335, A1$,B1$,C1$,D1$,E1$,F1$,G1$
610       IF J<>E THEN 640
620       A2$=""\B2$=""\C2$=""\D2$=""\E2$=""\F2$=""\G2$=""
630       GOTO 650
640     READ #1%J*R+335, A2$,B2$,C2$,D2$,E2$,F2$,G2$
650     !#1 FNV$(B1$,S(2)),A1$,TAB(42),FNV$(B2$,S(2)),A2$
660     !#1 C1$,TAB(42),C2$
670     !#1 D1$,TAB(42),D2$
680     !#1 E1$,"  ",F1$,"    ",G1$,
690     !#1 TAB(42),E2$,"  ",F2$,"    ",G2$,
700     !#1 \ !#1
710   NEXT J
720 NEXT I
730 CHAIN "DATAKEEP"
```

numeric fields and the recommended size of each of these fields.

Note that there are two columns of labels on the forms, so you must print two labels at a time (see Fig. 4). The function defined in lines 270–360 removes spaces from the end of the first name so that there is no gap between the first and last names when these are printed on the labels.

I placed four lines of print on each of the labels. The space reserved for each field can be increased if the program is modified so that only three lines are printed. You will recall that I have purposely limited the amount of information which may be stored in the database so that it will always be possible to display the records on the CRT.

Conclusion

Several attempts to complete this article were unsuccessful because I would think of something new to add to the programs just as I was about to start my writing. I would appreciate hearing from others who have made additional refinements.

Readers who want to purchase these programs on North Star disks should send $20 to the author. Specify single- or double-density.■

See List of Advertisers on page 242

Once you solve the problem of an overheated printhead, you can enjoy the capabilities of this fine printer.

Cool Down the H14

By J.C. Hassall

While the Heath H14 is a good, medium-speed dot-matrix printer, it has some inherent shortcomings. With long line listings, the printhead solenoids have a tendency to heat up; the printer controller circuitry compensates for the temperature rise by reducing the printer duty cycle. The result is that, while the printhead is kept from overheating, the printer's speed is drastically reduced. Fortunately, the forced-air cooling approach described here will overcome the problem.

Background

The printhead consists of seven solenoids which drive the character-forming print wires. When energized to print the character dots, the solenoids draw current. Part of the energy induced from that current (strictly speaking, the current-voltage product) is dissipated as mechanical energy as each print wire strikes the ribbon and prints a dot. The balance of the energy must be dissipated as thermal energy, which causes a temperature rise in the printhead.

As long as the surrounding air can cool the printhead, no damage is done. If the air cannot adequately cool the printhead, it will be damaged. So the controller circuitry reduces the duty cycle such that the printer will print a line, pause while the printhead cools, and repeat the cycle. The net result is that while the printhead is not destroyed, the time required for a long printout will be significantly longer than if the printer runs continuously.

The solution is to supplement natural convection cooling with fan-forced cooling air. Photo 1 shows one approach.

The general layout of the base is shown in Fig. 1. The outside dimensions are of little concern. If the dimensions shown are used, a standard 4½ inch muffin fan can be used with room to spare. As a result of the fan location, the air flow will be directly past the printhead access slot in the printer base. The air flow is down into the base past the printhead assembly and out through the fan.

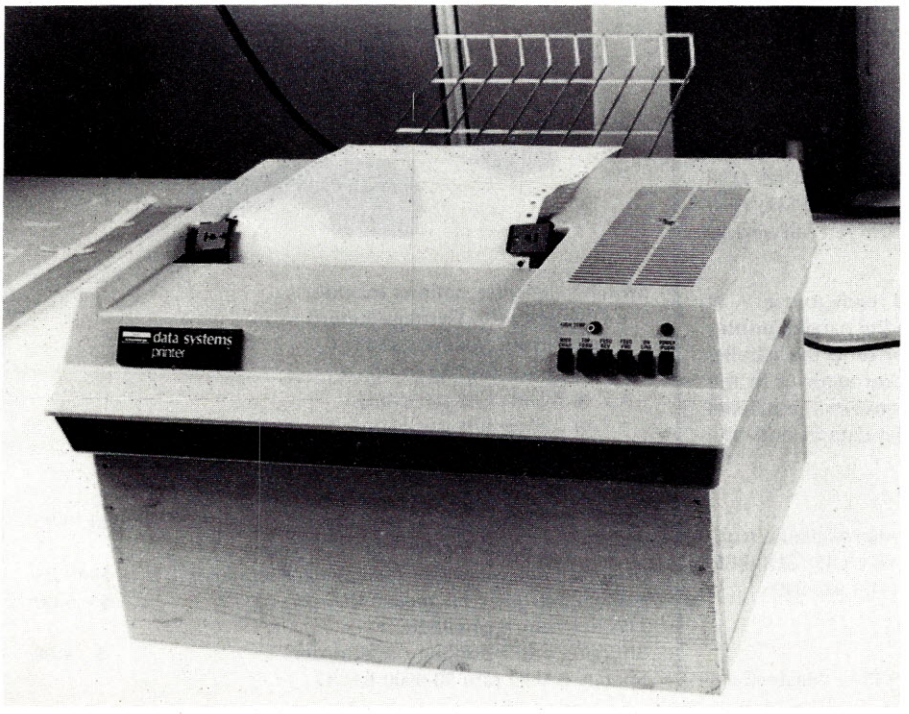

Photo 1. The H14 line printer installed on the cooling fan base. (Photos by Jan Wellman)

Address correspondence to J. C. Hassall, H & H Enterprises, PO Drawer H, Blacksburg, VA 24060.

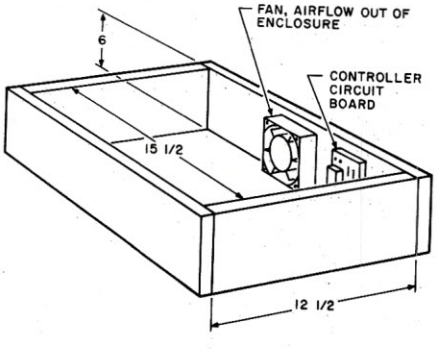

Fig. 1. The dimensions of the enclosure for the printer cooling fan. All dimensions are in inches. With these inside dimensions, the rubber feet on the printer base are a snug fit in the enclosure to prevent movement of the printer. For clarity, the interconnecting cables are not shown. To minimize air leakage, use self-adhesive foam weather strip in the top of the base to seal against printer base. Mount the fan in the middle of the board.

The first iteration of this design had the air flow in the opposite direction. With the air flow in that direction, the ribbon seemed to dry out very quickly, as evidenced by lighter-than-normal print. The ribbon also vibrated quite a bit in the air flow. Inexplicably, with the air flow down past the printhead, the above problems are not encountered.

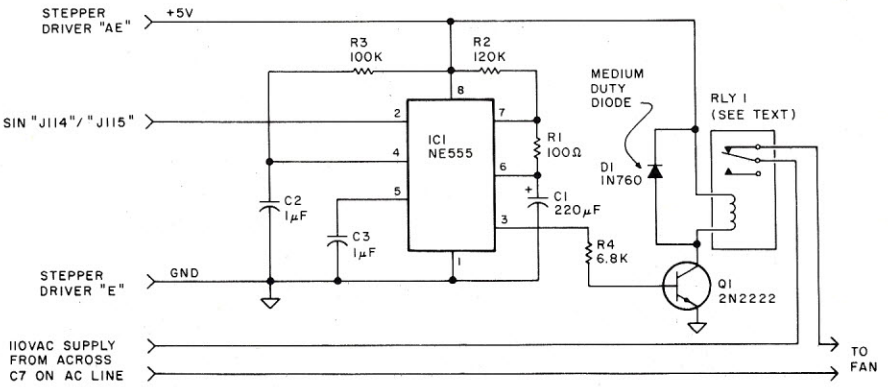

Fig. 2. The fan control circuitry for the H14 line printer forced-air cooling fan. The characters in quotes refer to pads on the H14 printed circuit boards. All resistors are ¼ W.

The Circuitry

As is seen in Fig. 2, the ubiquitous NE555 (IC 1) is used as a one-shot, triggered off the serial data stream input to the printer (the SIN line), to control the fan. Any high-to-low transition will trigger IC 1. Once triggered, it will stay triggered as long as data is being sent to the printer. After cessation of the data stream, the one-shot will keep the fan energized for a period of time and then turn it off. The cycle will repeat as data is sent to the printer. Once it is triggered, the output goes high, which turns on transistor Q1.

The transistor is simply a switch which provides a path to ground for the relay coil current. With the transistor turned on, the relay is energized and the fan turns on. The diode D1 across the relay coil protects Q1 from the voltage generated in the coil as the magnetic field collapses. Without the diode, Q1 could be blown when the relay is turned off.

Since the serial data rate bit period is much shorter than IC 1's on period, the incoming data stream will keep IC 1 triggered. Hence, the fan will stay on as long as data is being sent to the printer, and will only turn off one time constant after the data stream stops. The on time is calculated by

$$T_{on} = 1.1\ R2\ C1$$

where T_{on} is in seconds, R is in ohms and C is in farads. Optimum on time seems to be about 30 seconds. Depending upon the fan's flow rate and the amount of leakage between the base and the printer, a longer on time might be necessary. R1, shown in Fig. 2, is simply to protect the discharge transistor in IC 1 when C1 is discharged.

At first glance, it might appear that this circuit is merely a high-technology toggle switch. Why not just wait until the printer begins to slow down, then switch on the fan to cool things a little? The key to proper cooling of the printhead is prevention rather than cure. If the fan is not turned on until after the printhead has heated up, the amount of cooling air required would be greater than a muffin fan could provide.

So use two fans—after all, all that is needed is a little air to cool the printhead, right? Strictly speaking, that is true, except that a lot of air is required to quickly cool the printhead. The increased volume and speed of the air would cause the ribbon to vibrate severely, possibly damaging it or interfering with the printhead. The ribbon would also dry out much more quickly.

On the other hand, if the air flow heat dissipation capability matches the heat generation rate of the printhead, the temperature stays nearly constant and high throughput is maintained. As an added benefit with the reduced air flow, ribbon dry-out is significantly reduced. The circuit shown merely turns on the fan whenever the printer is accessed. So in a sense, the circuit is a high-technology toggle switch, but has the benefit of automatically controlling the fan.

Component Substitution

Whenever possible, it is always nice to be able to use components from stock, rather than buy them. That raises the question of component substitutions. There are no parts in the design which cannot be substituted. The preceding section in this article explained how to calculate T_{on} for different values of R2 and C1. The relay RLY 1 is a 5 V dc single-pole double-throw (SPDT) unit. A single-pole single-throw (SPST) could be used equally well.

Most of the parts houses which advertise in *Kilobaud Microcomputing*,

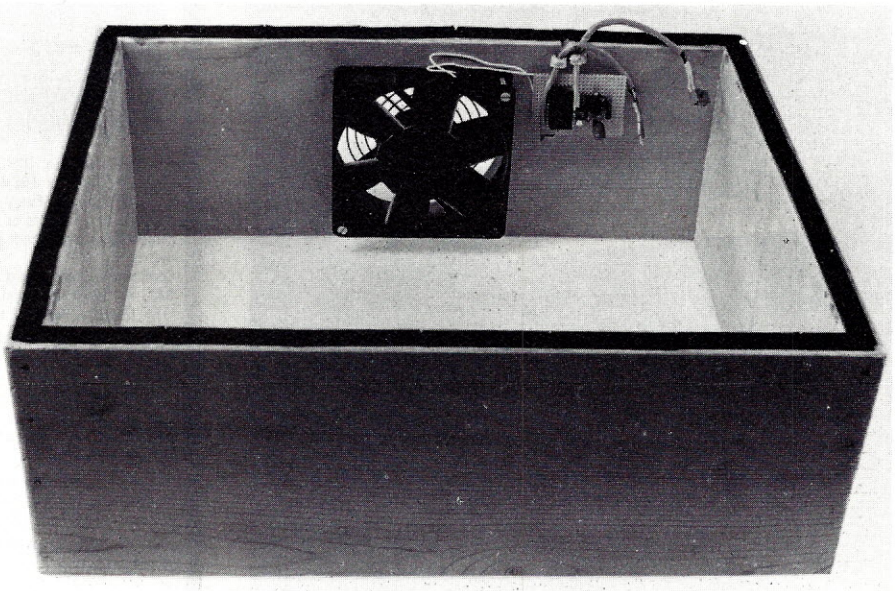

Photo 2. An interior view of the base, showing construction and component location details. The left-hand cable carries line voltage to the relay for the fan. Note that the pins are used on the input side of the cable as a safety precaution. Note also the gasket around the circumference of the box to help seal against air leakage.

such as Digital Research: Parts, Hobby World Electronics, etc., carry all the components needed.

Construction

Construction is very straightforward. As seen in Photo 2, all components are mounted on a piece of perforated circuit board, which in turn is held to two mounting blocks with double-sided tape—nothing fancy, but it works. Power and signals are brought to the board by two separate cables—one for signal and dc power and another for ac power (do not carry line voltage in the same cable as the signal and dc power).

I recommend that the two cables be separated or that the ac power cable be shielded and grounded. Line voltage spikes caused by turning the fan on and off seem to have been the cause of IC 1 being falsely retriggered. Connectors are desirable for both cables to facilitate moving the printer and fan housing if necessary (the whole assembly is rather bulky to carry).

To prevent foreign objects (such as fingers) from being struck by the fan blades, put a grille over the fan opening in the base, as shown in Photo 3.

Good safety practice requires that sockets (the female connector) be used to bring power from the printer to the controller. Power is very simply tapped from the line printer. The ac line voltage is brought out by attaching across capacitor C7 in the ac line. The +5 V dc power is brought out by soldering a lead to a spare pad immediately adjacent to pad AE on the stepper motor board. The +5 V dc ground line is brought out by sol-

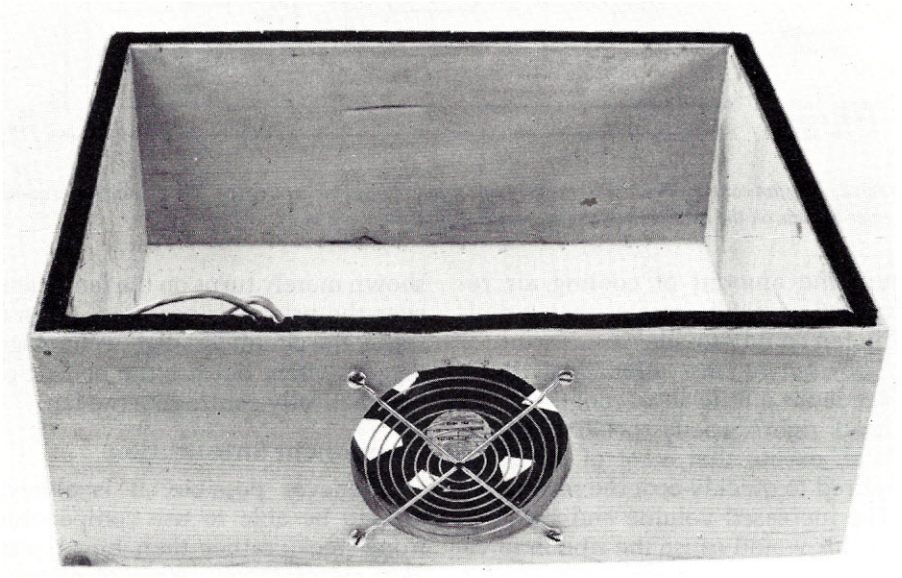

Photo 3. An often overlooked safety precaution is this grille for the fan. A fan should always have some protection for fingers and other objects.

dering a lead to a spare pad immediately adjacent to pad E on the stepper motor board. There are other attachment points available for the +5 V dc and ground, but these points are most convenient. The trigger line is brought out from the SIN line to the printer, at points J114 or J115.

Be careful about soldering to pads on the printed circuit boards. It is very easy to apply enough heat to loosen adjacent solder joints, possibly causing cold solder joints. A worse condition, and equally easy to do, is a solder bridge. So be sure to inspect all new solder joints, all adjacent solder joints and all adjacent traces on the printed circuit boards for bad solder joints, solder bridges and so forth, before applying power. In other words, just use good printed circuit board soldering techniques and you should avoid trouble.

Wiring the timer board is straightforward. Wiring pencil, wire-wrap or print circuit techniques can be used equally well.

Once construction is complete and all connections have been checked for continuity and shorts, the printer by itself should be tested to ensure that the various attachments had no effect on correct printer operation. Therefore, before plugging the fan controller and fan to the cables from the printer, print a line to check for proper operation. Check circuit operation before mating the 110 V ac connectors by briefly bringing pin 2 of IC 1 low; pin 3 should go high for approximately 30 seconds (be sure to prevent the 110 V ac connector from touching anything!).

Just use good printed circuit board soldering techniques and you should avoid trouble.

After the printer has functioned properly, remove power and plug in the control and fan. The fan should turn on as soon as the printer is turned on, stay on for about 30 seconds, then turn off. If the fan does not turn on, the unit has not been wired properly. Check that IC 1 is receiving +5 V dc; then check the logic level of IC 1, pin 3. Following the circuit description in the preceding paragraphs should locate the problem.

After the fan has turned off, print a line. The fan should turn on as soon as printing begins and should turn off about 30 seconds after printing has stopped. If the fan does not turn on when a line is printed, IC 1 is not being triggered by the SIN line to the printer, so your wiring to the printer should be checked.

Now that the controller circuitry has checked out, you are ready to use your H14 line printer to its maximum speed capability. No longer will throughput be degraded by printhead temperature.■

Acknowledgements

This article describes the work of two engineers from Poly-Scientific of Blacksburg, VA—Robert J. Marks and George D. Hughes.

✓See List of Advertisers on page 242

Are your stocks keeping up with inflation? Find out with this Microsoft program. Part 3.

Put Your Micro On Wall Street

By Dex Hart

This is the third (and final) portfolio program in this series. The first, Portval ("Put Your Micro on Wall Street," July 1981, p.126), tracked stocks in a portfolio from their purchase date; the second program, Timegain ("Put Your Micro on Wall Street," Aug. 1981, p.130), measured performance of the same stocks from one date to another. This final program applies a CPI (Consumer Price Index) ratio to see how your stocks have performed when indexed to inflation. All programs calculate dollar and percentage differences for individual stocks as well as for the total portfolio.

Timegain and CPIndex are short programs, and can be used with any Portval program (if you track multiple portfolios—his/hers, for example). This is because all data is contained in Portval and the other programs are chained to it. The particular language is Microsoft disk BASIC, and the first two articles explained some of the uses of print-using, a command form of MBASIC. It is extremely useful.

Program Use

The historical CPI data is available from the U.S. Department of Labor, Bureau of Labor Statistics, 441 G St., NW, Washington, DC 20212. It is supplied on two pages and gives the index by month and year from 1913 to the most recently-released figure. This series sets 1967 equal to 100. (Monthly copies of *NEWS*, the CPI update, will also be mailed to you on request.) The index was under 30 in 1913 and was 263.2 in February 1981. In application, the CPI number for the month and year of stock purchase is listed as the last data item (Y) for each individual stock (lines 100–140, Portval). Not used in Portval, the indexes come into play when CPIndex is called up (chained).

CPIndex asks you to input the latest index and date, then applies a ratio (F = Z/Y) of current to past CPI, times the original stock dollar investment (C), to calculate a theoretical value (V1). This theoretical value of any given stock is the price it should have reached, ignoring dividends, if it had just kept even with inflation. A percentage variance-from-theoretical (G1) is based on the difference between theoretical and actual current value. If you have found your stock performance less than satisfying when applying Portval and Timegain, CPIndex could ruin your whole day.

Note that CPI-adjusted data will look best if you have a high turnover—if you buy and sell often. If you tend to buy and sell rarely, and the average age of your portfolio is over five years or so, the results are likely to look dismal unless your choices have been of first quality. Don't feel bad; inflation is getting us all. Note also that high turnover masks—but in no way eliminates—the deadly effects of inflation.

When I chained Timegain last month, I used both chain and common statements to save memory (a common statement allows selection of specific variables to be chained—without it, *all* variables are passed). When setting up two programs for chaining, I had trouble, so I dropped the common statement and went to the naked chain. This necessitated some variable renaming so I didn't use the same variable twice. Accordingly, I have supplied here full, very slightly revised listings for Portval, Timegain and CPIndex, along with their sample runs, all of which work with each other.

Variables

Original Portval variables are unchanged, of course, although I added D2$ and P1 ("old" date and stock prices) for Timegain chaining and Y for the historical CPIndex. There are new variables in the two chained programs, some of which are intermediate values and do not appear on the run. The easiest way to identify variables may be to look at the runs in turn, with a left-to-right variable listing for column headings and totals (see Table 1).

Generally, if the variable name is the same, the variable is the same. The exception is G1 in CPIndex which is not the same as G1 in Time-

Portval headings:	A$, D$, S, C, P, V, D, G
Portval totals:	T1, T2, T3, T4
Timegain headings:	A$, S, P1, C1, P, V, R, D1, G1
Timegain totals:	T5, T2, T6, T7, T8
CPIndex headings:	A$, D$, Y, C, V, G, V1, G1
CPIndex totals:	T1, T2, T4, T5, T6

Table 1.

Address correspondence to Dex Hart, 9414 SW 142 St., Miami, FL 33176.

```
10 REM ****  CPINDEX  **** Universal Chain/Common Program
20 DIM D1(N),F(N),V1(N),G1(N)
30 T5=0:T6=0:T7=0
40 INPUT"Latest Consumer Price Index:  ",Z
50 INPUT"Date of latest CPI:  ",D3$
60 FOR I=1 TO N
70 F(I)=Z/Y(I)
80 V1(I)=F(I)*C(I)
90 D1(I)=V(I)-V1(I)
100 G1(I)=100*D1(I)/V1(I)
110 T5=T5+V1(I)
120 T7=T7+D1(I)
130 T6=100*T7/T5
140 NEXT I
150 PRINT CHR$(12)
160 PRINT"'CPINDEX' Inflation Performance Comparison—latest CPI: ";D3$;Z
170 PRINT TAB(37)"Stock prices as of:  ";D1$
180 PRINT
190 PRINT"                                  Purch   Current         Theo.  %Variance"
200 PRINT"   Stock      Date      CPI     Cost    Value   %Gain  Value  from Theo."
210 PRINT
220 FOR I=1 TO N
230 PRINT USING"## \        \ \     \  ###.#  ##### ";I;A$(I);D$(I);Y(I);C(I);
240 PRINT USING"   #####  ####.# ######  ###.#";V(I);G(I);V1(I);G1(I)
250 NEXT I
260 PRINT"_____________________________________________________________________"
270 PRINT "Totals";
280 PRINT TAB(30) USING"######   ######  ";T1;T2;
290 PRINT USING" ###.# ###### ####.#";T4;T5;T6
300 PRINT
310 INPUT "Hard copy?--YES enter 1 (printer on!)—NO hit RETURN  ",J
320 IF J=1 THEN 340 ELSE 330
330 END
340 LPRINT"'CPINDEX' Inflation Performance Comparison—latest CPI: ";D3$;Z
350 LPRINT TAB(37)"Stock prices as of:  ";D1$
360 LPRINT
370 LPRINT"                                  Purch   Current         Theo.  %Variance"
380 LPRINT"   Stock      Date      CPI     Cost    Value   %Gain  Value  from Theo."
390 LPRINT
400 FOR I=1 TO N
410 LPRINT USING"## \        \ \     \  ###.#  ##### ";I;A$(I);D$(I);Y(I);C(I);
420 LPRINT USING"   #####  ####.# ######  ###.#";V(I);G(I);V1(I);G1(I)
430 NEXT I
440 LPRINT"*********************************************************************"
450 LPRINT "Totals";
460 LPRINT TAB(30) USING"######   ######  ";T1;T2;
470 LPRINT USING" ###.# ###### ####.#";T4;T5;T6
480 GOTO 330
```

Listing 1. The CPIndex program.

Listing 2. The revised double-chain Portval program.

```
10 REM ****  "PORTVAL"  revised 29 Jan 81 for double chain
20 CLEAR
30 N=5
40 IF N<=10 GOTO 60
50 DIM A$(N),D$(N),S(N),C(N),P(N),P1(N),V(N),D(N),G(N),Y(I)
60 RESTORE
70 FOR I=1 TO N
80 READ A$(I),D$(I),S(I),C(I),Y(I)
90 NEXT I
100 DATA Carlisle, 29Sep80,160,9991,251.7
110 DATA Crown Cork,18Mar71,100,2231,119.8
120 DATA Humana," 7Mar77",900,4900,178.2
130 DATA Kysor,18Dec69,200,2758,112.9
140 DATA Travelers," 2Dec68",100,3511,106.4
150 FOR I=1 TO N
160 READ P(I)
170 NEXT I
180 READ D1$    'date of "new" prices—type w/o commas as item n+1
190 FOR I=1 TO N
200 READ P1(I)       'To update, input new prices just ABOVE line 230;
210 NEXT I           'keep old prices on 230, delete 240, then RENUM
220 READ D2$    'date of "old" prices
230 DATA 85,32,74.8,10.4,39.3,21 Jan 81
240 DATA 84.0,28.4,71.4,10.6,38.9,30 Dec 80
250 FOR I=1 TO N
260 V(I)=S(I)*P(I)
270 D(I)=V(I)-C(I)
280 G(I)=100*D(I)/C(I)
290 T1=T1+C(I)
300 T2=T2+V(I)
```

More →

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Listing 2 continued.

```
310 T3=T3+D(I)
320 T4=100*T3/T1
330 NEXT I
340 PRINT "Complete this run before chaining TIMEGAIN or CPINDEX"
350 INPUT"To run TIMEGAIN enter 1; CPINDEX enter 2; NEITHER hit RETURN  ",W
360 IF W=1 THEN 370 ELSE 380
370 CHAIN "TIMEGAIN",20,ALL
380 IF W=2 THEN 390 ELSE 400
390 CHAIN "CPINDEX",20,ALL
400 PRINT CHR$(12)        'clear screen
410 PRINT"'PORTVAL'         Portfolio Valuation       prices as of ";D1$
420 PRINT
430 PRINT"    Stock        Date  Shares  Cost  Price  Value    Diff   %Gain"
440 PRINT
450 FOR I=1 TO N
460 PRINT USING"##  ";I;
470 PRINT USING"\         \  ";A$(I);
480 PRINT USING"\      \  ";D$(I);
490 PRINT USING"###  ";S(I);
500 PRINT USING"#####  ";C(I);
510 PRINT USING"##.#   ";P(I);
520 PRINT USING"#####   ";V(I);
530 PRINT USING"#####  ";D(I);
540 PRINT USING"####.#";G(I)
550 NEXT I
560 PRINT"*************************************************************************"
570 PRINT "Totals";
580 PRINT TAB(29)USING" ######        ######   ";T1;T2;
590 PRINT USING"#####   ###.#";T3;T4
600 PRINT
610 INPUT "Hard copy?—YES enter 1 (printer on!)—NO hit RETURN  ",J
620 IF J=1 THEN 650 ELSE 640
630 GOTO 650
640 END
650 LPRINT "'PORTVAL'       Portfolio Valuation       prices as of ";D1$
660 LPRINT
670 LPRINT"   Stock         Date  Shares Cost  Price  Value    Diff   %Gain"
680 LPRINT
690 FOR I=1 TO N
700 LPRINT USING"## ";I;
710 LPRINT USING"\         \  ";A$(I);
720 LPRINT USING"\      \  ";D$(I);
730 LPRINT USING"###  ";S(I);
740 LPRINT USING"#####  ";C(I);
750 LPRINT USING"##.#   ";P(I);
760 LPRINT USING"#####   ";V(I);
770 LPRINT USING"#####  ";D(I);
780 LPRINT USING"####.#";G(I)
790 NEXT I
800 LPRINT"*************************************************************************"
810 LPRINT"Totals";
820 LPRINT TAB(28)USING" ######        ######   ";T1;T2;
830 LPRINT USING"#####   ###.#";T3;T4
840 GOTO 640
```

Listing 3. The Timegain program.

```
10 REM **** TIMEGAIN ****  use with PORTVAL and CPINDEX
20 DIM C1(N),D1(N),G1(N),R(N)
30 T5=0:T6=0:T7=0:T8=0
40 FOR I=1 TO N
50 C1(I)=S(I)*P1(I)
70 D1(I)=V(I)-C1(I)
80 G1(I)=100*D1(I)/C1(I)
90 T5=T5+C1(I)
110 T7=T7+D1(I)
120 T8=100*T7/T5
130 NEXT I
140 FOR I=1 TO N
150 R(I)=100*V(I)/T2
160 T6=T6+R(I)
170 NEXT I
180 PRINT CHR$(12)
190 PRINT"'TIMEGAIN' Stock Value Change Over Time—New prices as of ";D1$
200 PRINT TAB(42)"Old prices as of ";D2$
210 PRINT
220 PRINT"                      Old   Total   New   Current"
230 PRINT"   Stock     Shares Price   Cost  Price   Value   %Port    Diff   %Gain"
240 PRINT
250 FOR I=1 TO N
260 PRINT USING"## \        \ #### ###.#  ######  ";I;A$(I);S(I);P1(I);C1(I);
```

More →

gain. Sorry about that, but note that the two do not interact, so there is no harm. Also T5 and T6 in CPIndex are not the same as their Timegain counterparts. Remember when chaining not to reuse any variable name which appears in the source program.

Some programs are much clearer to read if long variable names are used (allowed by disk MBASIC). But there is so much retyping of names for read, field arithmetic, print using and lprint using that I felt the two-character variable was the better choice. But the list is not as bad as it looks, since there is a fair amount of commonality.

More on the CPI

There are a number of different CPI indexes. The one we're using is the CPI-U for urban. It includes all items—not a partial market basket. Note that the CPI-U is the one used for indexing union contracts, social security and so forth.

I won't try to get into the controversy on CPI's weaknesses. At the moment, it's the best measure because it's the one just about everybody else uses. Using it will certainly make the point that inflation is probably even worse than you had imagined.

Look at the sample runs (Listing 4). If the stock has an "old" purchase date, the performance from an inflation viewpoint is dismal even where the current dollar gain looked okay. Look at Crown Cork. Bought 10 years ago, its dollar gain is 43 percent with a current value of $3200. But, had the stock kept up with inflation, it would have been valued at $4851, so I'm down 34 percent in purchasing-power. In this particular case there is additional insult: Crown Cork does not pay a dividend.

Then we have Humana, a superwinner at 1274 percent gain. Bought fairly recently (four years ago), the gain shrinks to 840 percent when indexed. That's still great, but how many Humanas are there? And even then you've lost a quarter of your paper gain in just four years.

When your computer is down, use the handy "rule of 72," which helps compute the time needed to double or halve at some compound rate. For example, if you assume an inflation rate of 12 percent, divide 72 by 12. That means if you have $100,000 in bonds or in the money market, at 12 percent inflation (and assuming you need the interest to live on and do not reinvest it) your purchasing power

halves every six years. In 12 years, you've lost three-quarters of it.

You can use the CPI to make other valuations. Take gasoline, for example. As I write, I pay about $1.35 a gallon for no-lead. To keep it simple, what is the equivalent 1967 price? Multiply the cost per gallon by the 1967 CPI; divide by the current CPI. $1.35 × 100/263.2 = $0.513 = 51 cents a gallon. Perhaps this result will make you feel a *little* better.

Wrap Up

These three portfolio programs are simple but useful. They don't make decisions for you, but do give you neatly presented performance data. Data entry is easy. Prices are entered on a line or two. Stock sale or purchase is also simple, as all individual stock data (except price) is on a single line. You can add or delete whole lines. The main idea is to make the process easy enough that you will actually make the entries and see what's really happening. With luck, you'll then be alerted to make more timely decisions than you might have without the programs.

The format of read-data, field arithmetic and print-using is useful in manipulating bundles of data other than common stocks and formatting them in the most useful fashion. In other words, you don't have to be J.P. Morgan to put this general type of program to use.■

Listing 3 continued.

```
270 PRINT USING"###.#  ######  ###.#   ######  ####.#";P(I);V(I);R(I);D1(I);G1(I)
280 NEXT I
290 PRINT"_____________________________________________________________________"
300 PRINT "Totals";
310 PRINT TAB(27)USING"######         ######  ";T5;T2;
320 PRINT USING"###.#   ######  ####.#";T6;T7;T8
330 PRINT
340 INPUT "Hard copy?—YES enter 1 (printer on!)—NO hit RETURN  ",J
350 IF J=1 THEN 370 ELSE 360
360 END
370 LPRINT"'TIMEGAIN' Stock Value Change Over Time—New prices as of ";D1$
380 LPRINT TAB(42)"Old prices as of ";D2$
390 LPRINT
400 LPRINT"                    Old   Total   New   Current"
410 LPRINT"   Stock     Shares Price   Cost  Price   Value   %Port    Diff   %Gain"
420 LPRINT
430 FOR I=1 TO N
440 LPRINT USING"## \        \ #### ###.#  ######  ";I;A$(I);S(I);P1(I);C1(I);
450 LPRINT USING"###.#  ######  ###.#   ######  ####.#";P(I);V(I);R(I);D1(I);G1(I)
460 NEXT I
470 LPRINT"*****************************************************************************"
480 LPRINT"Totals";
490 LPRINT TAB(27)USING"######         ######  ";T5;T2;
500 LPRINT USING"###.#   ######  ####.#";T6;T7;T8
510 GOTO 360
```

Listing 4. Sample runs from the Portval, Timegain and CPIndex programs.

```
'PORTVAL'      Portfolio Valuation       prices as of 21 Jan 81

   Stock         Date  Shares Cost  Price  Value    Diff   %Gain

 1 Carlisle    29Sep80  160   9991  85.0   13600    3609    36.1
 2 Crown Cork  18Mar71  100   2231  32.0    3200     969    43.4
 3 Humana       7Mar77  900   4900  74.8   67320   62420  1273.9
 4 Kysor       18Dec69  200   2758  10.4    2080    -678   -24.6
 5 Travelers    2Dec68  100   3511  39.3    3930     419    11.9
*************************************************************
Totals                        23391         90130   66739   285.3

'TIMEGAIN' Stock Value Change Over Time—New prices as of 21 Jan 81
                                        Old prices as of 30 Dec 80

                  Old   Total   New   Current
   Stock     Shares Price   Cost  Price   Value   %Port    Diff   %Gain

 1 Carlisle    160  84.0   13440  85.0   13600   15.1     160     1.2
 2 Crown Cork  100  28.4    2840  32.0    3200    3.6     360    12.7
 3 Humana      900  71.4   64260  74.8   67320   74.7    3060     4.8
 4 Kysor       200  10.6    2120  10.4    2080    2.3     -40    -1.9
 5 Travelers   100  38.9    3890  39.3    3930    4.4      40     1.0
*************************************************************************
Totals                      86550         90130  100.0    3580     4.1
'CPINDEX' Inflation Performance Comparison—latest CPI: Jan 81 260.5
                                    Stock prices as of:  21 Jan 81

                                Purch   Current          Theo.  %Variance
   Stock      Date      CPI     Cost    Value   %Gain    Value  from Theo.

 1 Carlisle   29Sep80  251.7    9991    13600    36.1    10340    31.5
 2 Crown Cork 18Mar71  119.8    2231     3200    43.4     4851   -34.0
 3 Humana      7Mar77  178.2    4900    67320  1273.9     7163   839.8
 4 Kysor      18Dec69  112.9    2758     2080   -24.6     6364   -67.3
 5 Travelers   2Dec68  106.4    3511     3930    11.9     8596   -54.3
*************************************************************************
Totals                        23391    90130   285.3    37314   141.5
```


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Choosing educational software can be more perplexing than a multiple-choice question. Here's an approach that can help improve your grade.

Which Courseware Is Right for You?

By Donald C. Holznagel

Microcomputer software for education is moving so quickly that most school staffs have trouble staying abreast of current developments. Whereas the major problem two years ago was finding any software at all, we now find a large number of programs and program packages available from almost 200 producers.

Certainly, for some systems, the quantity of educational packages is still small, but for most of the systems being bought by schools, a large number is available. The entry of the large publishers of educational materials in the computer courseware market foretells a steadily increasing supply.

As a result of this increase, the major problem for many school users of microcomputers has also changed to a two-dimensional one of identifying sources and quality of software. In the first dimension, teachers or administrators need to be able to determine what software and courseware is available for the computer they have purchased or plan to purchase, and for the subject matter and age range in which it is to be used. Second, they want to know which items in that list of possibilities are of high quality and have been found to be useful in a classroom environment.

Although the question of software availability ought to be investigated prior to purchasing hardware, schools still typically buy a computer first; they are then surprised to find that not many application packages are available for that computer. In these situations, any consideration of quality may be beside the point: they use what's available or the machine falls into disuse. For most purchasers of major brands, however, and for those schools investigating the software market in advance of purchase, identifying appropriate software and assessing it are the major problems.

To address the problem of identification, several different efforts have been made to produce commercial catalogs or directories. Most of them are general, providing information on software for a variety of computers and areas of application. Some focus on a single brand of computer. There is one directory (not a sales catalog) which attempts to provide, for the field of education only, a comprehensive list of software and courseware for all microcomputers. The directory, *School Microware* from Dresden Associates, provides such information as source, cost, grade level and a brief description organized by subject area and by hardware brand.

Most current efforts at evaluation are characterized by a narrative review written by one person, published in a magazine or journal. These evaluations are scattered through a variety of publications, which may or may not be on hand in many schools. Criteria and approach usually vary with evaluators and publications. From the schools' standpoint, it would be valuable to have a source of a large number of evaluations, done with a consistent procedure and set of criteria.

The Computer Technology Program of the Northwest Regional Educational Laboratory has recently been developing an approach to the evaluation problem through its MicroSIFT clearinghouse sponsored by the National Institute of Education. For our model we have identified four general stages of evaluation: sifting, description, peer evaluation and in-depth evaluation. In addition, we have set up and tested a process for carrying out evaluation activities on a regular basis, which will be described later in this article.

There are other approaches to the evaluation of instructional courseware, and one can find a variety of checklists or forms developed and used by school districts or other agencies. The National Council of Teachers of Mathematics has produced its own set of criteria, and the EPIE Institute has supported courseware evaluation in conjunction with the Microcomputer Center of Teachers College, Columbia University. In Canada, JEM Research in Victoria, BC, is conducting evaluation activities for the Ministry of Education.

The description of process and criteria in this article does not imply comparisons with other efforts and no such comparison has been made. Rather, the factors discussed here should be viewed as an example of

> For those schools investigating the software market in advance of purchase, identifying appropriate software and assessing it are the major problems.

Donald C. Holznagel is the coordinator of MicroSIFT, Northwest Regional Educational Laboratory, 300 SW Sixth Ave., Portland, OR 97204.

the kinds of considerations which concern classroom teachers. They are similar in part to criteria traditionally applied to audio-visual media.

A Set of Sieves

The stages of evaluation can be envisioned as a set of sieves in which the holes are of progressively smaller diameter. The first stage, sifting, is the coarsest screen. It is first of all a gross determination of whether or not a given program or package can be considered instructional or educational. No determination of relative quality is made. Rather, a decision is based on a cursory examination that the package can be imagined to have possible classroom application.

At this stage also, a quick examination of the package should indicate whether sufficient supporting information is on hand to be able to carry out an evaluation, including at least information required to load and run any programs involved. Finally, the programs must load and run. We refer to all computer-based instructional materials from this point on as packages, which means not only one or more computer programs but also related operational documentation, teacher and student support materials and containers. Descriptive and evaluative criteria are applied to the entire package. Rarely, if ever, do education programs stand alone, independent of documentation.

In the description stage, much factual information is identified, although some items are the results of subjective judgment. The subject matter and specific topic, grade and ability level, required hardware, language and system software are all important if one is to identify packages appropriate to needs.

In addition, some identification of the instructional techniques used in the package is required. Simulation, drill and practice, tutorial, games and information retrieval are common techniques used in instructional packages. In many cases, more than one technique is used. Sometimes judgments must be made, such as in differentiating between a game and a simulation, although frequently the effort involved in making that distinction is not worth the time.

Two categories are worth special mention because of the evaluative judgments made by teachers and others regarding the value of those techniques. For some people, the term "games" implies a recreational activity which is not instructional. Also, some consider drill-and-practice to be a low-level activity better done with paper and pencil than on a computer. For evaluation results to be useful to a wide range of teachers, there should be no judgment that a package is "good" or "bad" because it employs a specific technique. Rather, an evaluator should concentrate on the quality of the implementation of the technique, recognizing that some teachers find both games and drill to be effective in a variety of classroom situations.

Finally, in the description stage, it is important to identify the instructional objectives which a student is intended to reach, and the prerequisite activities or knowledge for successful student use. This is crucial information if teachers are to determine where and how well a package will fit in the curricula of their schools.

The third stage of the evaluation model is a peer review. It is intended to be carried out by teachers whose experience is in the subject area and grade or ability level of the package, and includes the use of computers in instruction. The criteria are in three categories: content, instructional quality and technical quality.

In the area of content, we are concerned with the accuracy of the material being presented, including consideration of factual errors, validity of models and up-to-date information. Some judgment of educational value is important in terms of the degree to which the content fits into common school curricula or has common utility in life.

Instructional quality deals with the variety of considerations related to instructional processes. Of paramount importance is the definition of purpose of a package, and the degree to which the purpose can be achieved by using it in the manner specified. Clear and logical presentation of content and a level of difficulty appropriate to the target audience are important considerations. Microcomputer features such as graphics, sound and color should be used for appropriate instructional reasons.

A package should be motivational and stimulate creativity. Learner control of the rate and sequence of presentation of material is important to many users, although the desirability of it in some techniques such as drill-and-practice varies from teacher to teacher. Again, it is important to identify the degree of learner control and the quality of its implementation and let the readers of the evaluation determine whether the concept is "good" for them in their environment.

Considerations in technical quality include the quality of user support materials, how complete and comprehensive they are and their effectiveness. The effectiveness of the information displays—whether text, forms, graphics or combinations—is important. Ease of use by students and teachers in typical classroom situations, especially by people having little experience with computers, is critical to successful widespread use of a package. Saving the naive user from a variety of problems resulting from inadvertent keystrokes, and making a package as forgiving of mistakes as possible, are as important in education as elsewhere.

A major concern in this category is the appropriate use of computer abilities, ensuring that a package capitalizes on the possibilities for dynamic, interactive programs and makes effective use of peripheral devices. A computer which merely presents printed material sequentially is no improvement over a textbook or lecture.

A computer which merely presents printed material sequentially is no improvement over a textbook or lecture.

MicroSIFT

In the MicroSIFT process, the evaluation described above is a professional opinion rendered by a person who is a peer of the teacher who will be the consumer of the package. It would be desirable in most cases to base an evaluation on student use of a package. This is especially true of the packages which cover a significant portion of the curriculum, such as K–6 mathematics. Such evaluation might include pretests and post-tests, observation of student use and anecdotal records from the observation. That kind of activity, however, is expensive and time-consuming. The

MicroSIFT project will not be able to implement this level of evaluation in most cases.

The evaluation process established in the MicroSIFT project is based on the cooperation of a network of prominent educational agencies having experience with the development, evaluation and use of instructional computer applications in elementary and secondary schools. The network members have staff whose time is dedicated to instructional computing and who interact with teachers on a regular basis. The agencies are large school districts and regional or state-level consortia and service centers which have agreed to voluntarily participate in information sharing and evaluation activities. Every major brand of microcomputer hardware is represented in some member agency, and minor brands as well.

The sifting and description stages of the evaluation process are completed for the most part by MicroSIFT staff. The network member's role is to select teachers with the appropriate background to be evaluators, distribute packages and collect evaluations. At least two teachers evaluate each package, and an instructional computer specialist at the network member site completes a summary evaluation combining the teacher evaluations with his/her own perceptions. If more than one network member evaluates a package, MicroSIFT staff members combine the reviews.

About three months are required to complete a cycle of reviews, so that publication of evaluations should proceed quarterly. Courseware evaluation is not an easy task, consuming three to 12 hours of a person's time, depending on the complexity of a package. Finding teachers with the right qualifications, time and willingness to participate is difficult. However, the results are important and worth the effort. In some cases, network members are bringing teacher-evaluators together in groups, which helps them carry out the tasks more efficiently.

MicroSIFT will continue to improve the evaluation process, especially with regard to phases 3 and 4. During the 1981–82 year, criteria will be drafted for assessing microcomputer software for school administration and instructional management applications. A series of documents are planned to disseminate information concerning issues of interest to schools planning for microcomputer use. Such topics as efficient and effective use and teacher training will be addressed, with the information based on the experience of schools and districts served by network member agencies and others.

The *Evaluator's Guide for Microcomputer-based Instructional Packages* is a booklet which incorporates forms for the description and peer evaluation stages and includes detailed guidelines for the whole list of criteria summarized in this article. Evaluations resulting from the formal process described above are completed in quarterly cycles. As this is written, the specific modes of dissemination for both the *Guide* and the evaluations have not been determined. The information on obtaining them will be available by the time this is printed from the Computer Technology Program, NWREL, 300 S.W. Sixth Avenue, Portland, OR 97204 (503-248-6800).■

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4014	.95	4052	.95	4515	2.25
4015	.95	4053	.95	4516	1.50
4016	.45	4055	2.75	4518	1.25
4017	.95	4056	2.75	4519	1.25
4018	.95	4059	9.95	4520	1.25
4019	.45	4060	1.25	4522	1.25
4020	.95	4066	.75	4526	1.25
4021	.95	4068	.40	4527	1.75
4022	.95	4069	.40	4528	1.25
4023	.35	4070	.40	4531	.95
4024	.75	4071	.30	4532	1.75
4025	.35	4072	.30	4539	1.75
4026	1.95	4073	.30	4543	1.95
4027	.65	4075	.30	4553	4.95
4028	.80	4076	.95	4555	.95
4029	.95	4078	.50	4556	.95
4030	.45	4081	.40	4558	2.25
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This do-it-yourself interface adapter combines the H89 and the TRS-80 Line Printer—at a significant savings over commercially available adapters.

A Printer for the H89

By Raymond S. Isenson

Interfacing a Centronics-type line printer to your Heath/Zenith-89 microcomputer can be simple and inexpensive. Just install an easily-built circuit board in your computer and make a few software changes—you'll get the parallel output port you need without buying an expensive printer interface. If you want to add some other peripheral device requiring a parallel port, you can probably use a similar modification.

The H/Z-89 is configured to permit three serial output ports. External connection to the ports is made on conventional 25-line subminiature D hardware at RS-232 levels. Knockout plug provisions on the rear apron of the computer console suggest that Heath/Zenith will, at some future time, provide IEEE-488 busing.

But for now, the H/Z-89 configuration doesn't offer a parallel output port; I needed one to drive my Centronics 779 printer, so this is what I devised.

Adding a Parallel Port

The three serial output ports of the Heath computer are generated on a single printed circuit board that plugs into the main CPU logic circuit board. This serial interface board is an extra-cost accessory for the H-89, and perhaps for the Z-89 as well. No active board circuitry is used to achieve parallel output capability, so you might conclude that the board isn't needed, but it is used to provide terminal points for extracting data and input points for control.

An additional circuit board is plugged into a socket that otherwise would hold an 8250 ACE (asynchronous communication element) used for one of the serial ports. The original purpose of the socket, of course, is lost, and the H-89 then has only a two-port serial capability. The serial interface board is not modified in any significant way. The 8250 ACE can be replaced later if you wish.

R. S. Isenson, 4168 Glenview Drive, Santa Maria, CA 93455.

Obviously, the adapter board could be designed to plug directly onto P511, the CPU logic board header pins that are provided for the mating of the serial interface board. This would eliminate the hookup for either the cassette recorder, floppy disk or serial output ports.

I wanted cassette recording ability for file storage and at least one serial port for a communications modem. And I was not about to give up the floppy disks. For someone without all three of these requirements, the serial interface board would be little more than a $125 connector. To eliminate it, the parallel adapter should be laid out a little differently, and a different input connector should be chosen. The circuitry is unchanged.

Printer Input

The required input to the Centronics Model 779 (Radio Shack Line Printer I version) is a seven-bit ASCII character word and a Print Enable command. The Print command, according to the Centronics manual, must be at least one μs, during which time the information presented on the seven data lines must be stable and unchanging. Incoming data flows to a buffer with permitted flow rates of up to 75,000 characters per second.

When the printer receives a carriage return character, or when the buffer is loaded with a user-prescribed number of characters (default is 132), the printer generates a busy signal and goes about its business of printing and repositioning the print head. The busy signal is cancelled when the printer is ready to receive more data.

Other signals available from the printer include "acknowledge," which is generated when the data word is accepted into printer memory and to mark the end of a functional operation, and a signal indicating whether or not the line printer is turned on and supplied with paper.

The Z-80 microprocessor outputs the needed ASCII-formatted word to the data bus. When this data is steady, it generates a $\overline{WE}$ (write enable not) pulse which, with some massaging, could be the Print Enable command sought by the printer. The H/Z-89's CPU will respond to a busy signal from the printer if it is inverted to become $\overline{WAIT}$ (wait not). But you still must consider the different timing requirements of the two machines.

A Timing Fix

Fig. 1 shows the memory write cycle of the H/Z-89. The $\overline{WE}$ pulse is less than 0.5 μs—hardly compatible with the one μs minimum pulse length needed for the Print Enable command. If the $\overline{WE}$ signal is simply stretched to satisfy the printer requirements, the data will not be steady throughout the extended period.

But the timing incompatibility can be solved. There is a minimum of 3.5 μs between occurrences of the memory write cycle. You just have to store, external to the computer, the $\overline{WE}$ pulse and the data word for more than one and less than 3.5 μs, and to present the information at the input to the

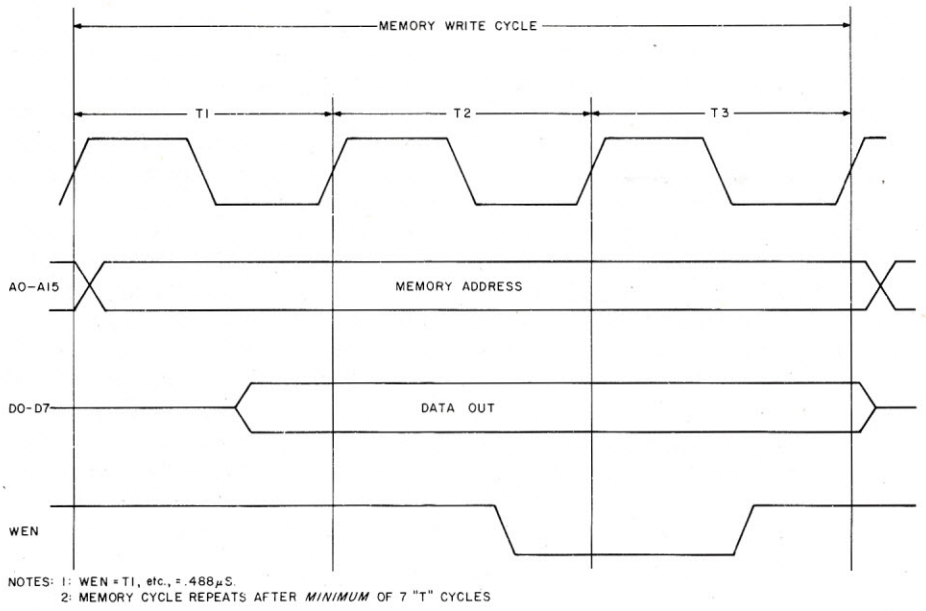


Fig. 1. Z-80 memory write cycle. (Source: Z-80 CPU Technical Manual, Zilog)

printer during that interval. The printer will be able to loaf along at its own pace.

One way to do this with about $5 worth of readily available ICs and hardware is described below. This design should work for all Centronics-type parallel printers. I'll also outline some alternatives with minor design changes to meet the requirements of different peripheral devices.

Fig. 2 shows that each line of the eight-line data bus is brought to an input pin of a 74LS75 quad latch. (The most significant bit is carried through the latch to an open terminal. It is not required for the normal seven-bit ASCII character word, but could be needed for some special characters or for peripherals other than printers.) These latches will ensure that the data is steady and unchanging at the input to the line printer during the active period of the Print Enable command.

Each of the serial ports on the serial interface board is software selectable by the CPU. In hardware terms, this means that one of three connecting pins of the header on the CPU logic board is activated whenver its port is addressed.

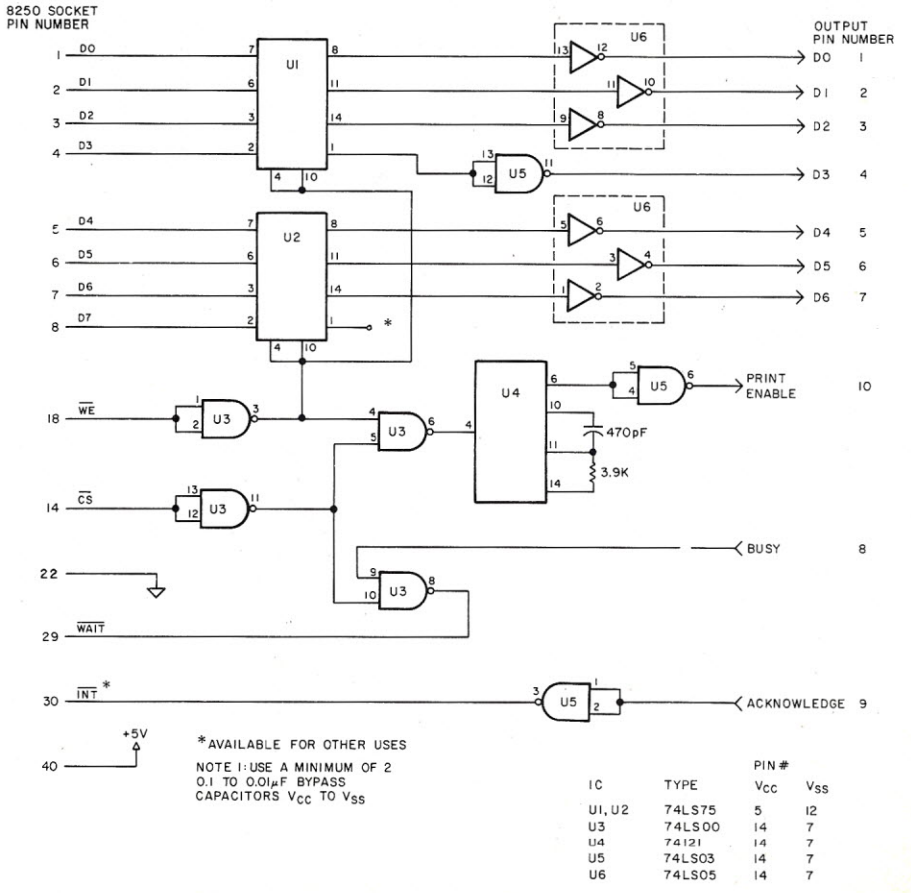
I chose the center section of the serial interface board to couple the parallel port to because pin 9 of plug P511 is uniquely associated with that (in Heath parlance, the alternate terminal) port. The signal level at this pin goes low when that port is addressed. This signal is referred to as $\overline{CS}$ (chip select not).

When $\overline{CS}$ and $\overline{WE}$ are both low, the CPU is directing data to the alternate terminal port. Referring again to Fig. 2, these signals are inverted using two available gates of a 74LS00 NAND chip. The inverted $\overline{WE}$ provides the positive-going pulse needed to transfer the data to the output of the quad latch 74LS75s, where it will remain, unchanged, for at least 3.5 μs until the next occurrence of the $\overline{WE}$ pulse.

The two inverted signals, CS and WE, are logically NANDed to provide a trigger pulse for the 74121 monostable multivibrator used to generate the actual print enable pulse. The reason for using the NANDed signal is straightforward—only when these signals are coincident is there steady data intended to go to the selected output port.

The output pulse duration from a 74121 is calculated from the formula R*C*Ln2, where R and C are the timing resistor and capacitor associated with the 74121. For the selected components of R = 3.9k and C = 470 pF, the natural logarithm of 2 being slightly less than 0.7, a pulse duration somewhat longer than 1.25 μs is achieved. The pulse is inverted and transmitted to the line printer by way of the paralleled input of an open collector 74LS03 NAND chip to become the Print Enable command.

The data word is taken from the $\overline{Q}$ (Q not) outputs of the 74LS75s, inverted in the 74LS05 open collector hex inverter and presented to the line printer. In order to avoid using another inverter chip, the most significant bit is transmitted through the



IC	TYPE	PIN # Vcc	Vss
U1, U2	74LS75	5	12
U3	74LS00	14	7
U4	74121	14	7
U5	74LS03	14	7
U6	74LS05	14	7

Fig. 2. The parallel output port adapter.

available gate of the 74LS03.

There are 1k pull-up resistors at each of the signal inputs of the Centronics printer. The open collector chips were used because some noise immunity is gained by using the open collector drivers, and because the pull-up resistors permit this.

For other applications of the parallel output port, it may be desirable or necessary to replace the 74LS03 and the 74LS05 with 74LS00 and 74LS04s, respectively, or for a non-TTL application, with a 74LS26 and 7406 high-voltage driver. If signal inversion isn't wanted, buffer drivers can be used. In short, the interface output circuitry is flexible.

Although Heath makes no use of the $\overline{\text{WAIT}}$ (wait not) signal on the serial interface board, access to the appropriate signal line is afforded through pin 8 of the CPU header (again, P511). To get to it I made use of the fact that pin 29 of the 8250 ACE is not internally connected and, therefore, the socket at pin 29 does not connect to the chip.

I added a jumper on the serial interface board to connect the female header at pin 8 to pin 29 on the 40-pin socket that becomes the jack for the parallel adapter board. This provides a circuit path for the busy/wait signal.

If, at some later date, you want to regain the third serial port—at the expense of the parallel output port—you just need to remove the adapter board and replace the 8250 ACE. The jumper wire will be open circuit at the chip pin and need not be removed.

Handshaking

That's the entire interfacing circuit. Handshaking is provided through the wait/busy signal. As long as this signal is low at the line printer, indicating not busy, data can flow from the computer at rates up to 75,000 character words per second. This flow rate was previously noted.

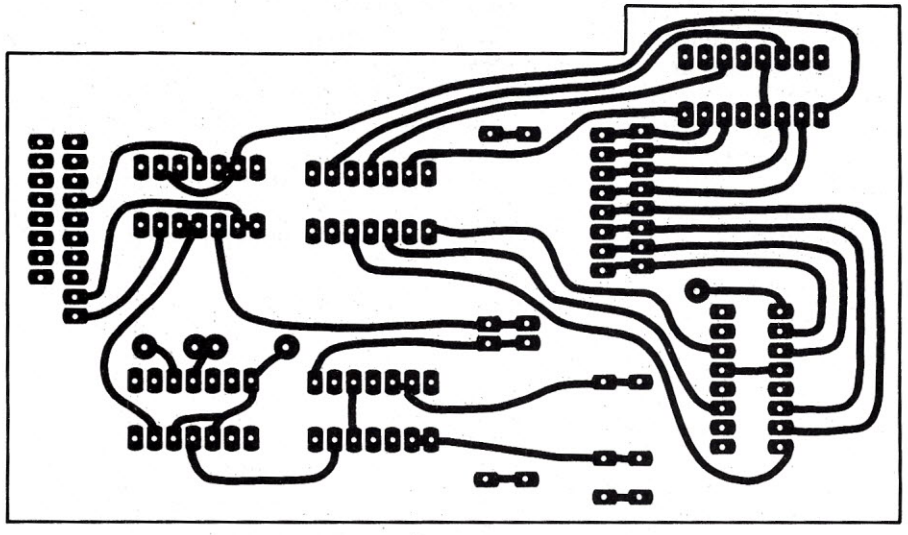
It turns out to be conveniently high for the following reason. Consider the converse situation, where the acceptable data flow rate is significantly below the computer baud rate. It's obvious that the computer would have to be stopped or placed into a holding loop between each transmission of a character, or the interfacing circuitry would have to be afforded a buffer memory capability.

Thus it is the high permitted data flow rate that allows the simple interface circuit and enables a reasonable printing speed. It is the buffer in the printer that enables the high data flow rate.

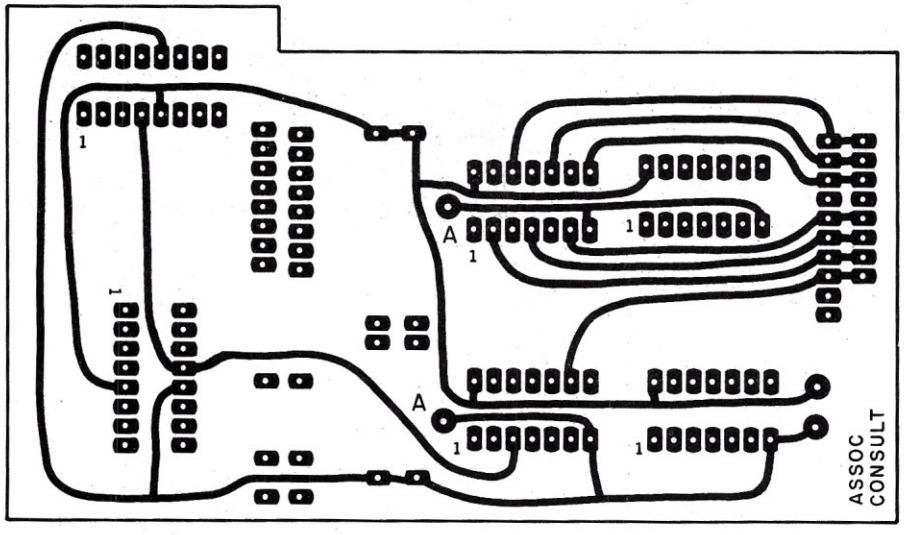
When the printer's buffer is filled, and during the printing or print head return operation, the busy signal goes high. This signal is NANDed on the interface board with the inverted $\overline{\text{CS}}$ to accomplish two ends.

First, inverting the signal changes it to the low level required by the Z-80 to force the CPU into a marking time mode.

Second, and equally important, the NANDing with CS ensures that the Z-80 is protected against any level changes in the line printer busy signal that might occur, for any reason, when the computer isn't actually addressing the line printer. Thus, data flow is interrupted only when there is a coincidence of the busy and $\overline{\text{CS}}$ signals. This is the circuit that provides the line printer's input to the handshaking function, such as it is.



"PLUG" SIDE



COMPONENT SIDE

Fig. 3. Adapter board—drilling and etching patterns. An insulated jumper wire must be installed connecting points A–A.

An Alternative Solution

I mentioned that the Centronics printer outputs an acknowledge pulse indicating the input of a character into memory or the end of a functional operation. I considered using a 74LS122 instead of the 74121 to generate the print enable pulse.

With the former, pulse start would be accomplished as it is with the 74121; pulse termination, however, would be positively controlled by using the acknowledge pulse to gate off the 74LS122.

This approach assures the adequacy of the print enable pulse. I used the 74121 because the chip was on hand and the test circuit worked. The

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alternate solution is pointed out as a possibility for a more flexible design.

Installing the Board

I assembled the parallel data interface circuit on a 7×11.5 cm double-sided etched circuit board. The assembled circuit, mounted in its socket on the serial interface board and installed in an H-89, is seen in Fig. 3. This points out the physical constraints on the added board and shows the locations of the six integrated circuits.

Photo 1 shows the plug side of the board. The plug connecting the serial and parallel interface boards is made of a conventional 40-pin DIP header. The manner of fastening the header to the adapter board can be seen in the photograph. Rather than drilling holes to accommodate all 40 pins of the header, I drilled two holes on 0.5 mm (0.2 inch) centers on a line centered on, and normal to, each of the locations at which circuit connections between the two boards were needed. The associated pin numbers are listed in Fig. 2.

I used a paper stick from a cotton swab as a form, and formed #26 wire loops at each of the 14 locations. These loops, soldered to both sides of the board, provide the necessary standoff distances to keep the serial and parallel interface boards physically separated.

The 40-pin header was readily seated on the loops and soldered into place with its pins extending out as seen in the photo. IC sockets for the six integrated circuits were made of molex pins. I used the pins instead of conventional solder tail sockets to simplify the through-the-board connections for the double-sided board.

I fabricated a ten-conductor cable to go from the parallel interface board to the rear panel of the computer console. Signals carried on this cable are for the seven data lines for the ASCII character word, the Print Enable command, the printer busy signal and the acknowledge signal (which is not currently used).

Signal ground is available at the rear panel of the console, so there was no need to carry it from the parallel interface board. A standard Centronics printer-to-RS-232 subminiature D connector cable is used between the printer and the computer. The ten-conductor cable was configured at the rear panel end to provide the necessary wiring alignment.

The adapter board is plugged into the center 8250 ACE socket on the serial interface board. This, from the computer's point of view, is address 320Q. The ATH84.DVD device driver routine, resident in the Heath disk operating system (HDOS), addresses port 320Q, and is adequate to drive the line printer.

The Set command affords the flexibility to tailor the routine, as described in the Heath manual.

I checked out this parallel interface adapter on the Heath H-88 computer (cassette system software, no HDOS) with a short program in Extended Benton Harbor BASIC, in accordance with the appropriate Heath software manual. The output was properly directed to the Centronics line printer.

If the serial interface board with the mounted parallel output adapter and the cassette interface board are plugged into the CPU logic board as shown in the Heath operation manual, there will be a mechanical interference between the adapter and the cassette board. The problem is avoided by interchanging the serial interface and cassette interface boards.

The two headers on which these boards mount are in exact circuit parallel, so it makes no difference which goes where. A similar repositioning of the cassette board will probably be necessary if a parallel data output board is made up to connect directly to the 10- and 25-pin sets of the headers on the CPU logic board instead of the serial interface board.

Other Solutions

Other options? The etched circuitboard assembly technique could possibly be replaced by a wire-wrap board. This requires a bit of ingenuity to mate to the serial interface board or the CPU logic board if you are following the direct-connection scheme.

Alternatively, a wire-wrap board could be conveniently placed within or without the computer console, and connected to the serial interface board with a suitably terminated jumper cable.

Obviously, there are a number of possibilities for the mechanical design; I'd like to see your solution. ■

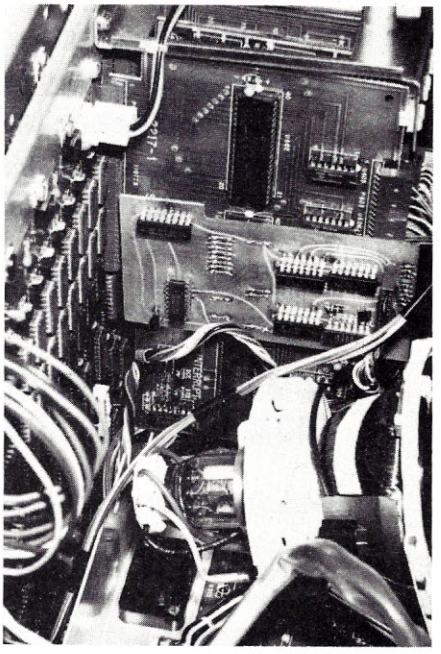

Photo 1. The parallel adapter mounted on the serial interface board.

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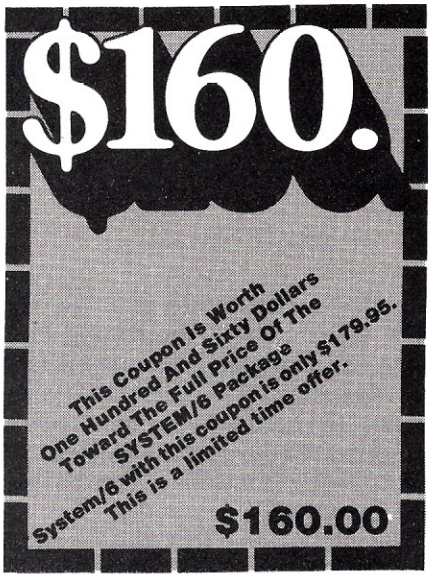

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It's about time that CP/M system disks were made aware that CRT terminals have replaced TTYs.

Updating CP/M's STAT Utility

By Ken Barbier

What in the world is a 'tee tee wye'?'' asked the Young Programmer. His question made me feel my advancing years. Surely everyone knows that on the front end of every computer is a slow, noisy old ASR-33 Teletype (TTY) machine? Or was that five years ago?

The days when a TTY was the standard computer console have, thankfully, passed. Now, a CRT terminal will actually cost less than the old mechanical monster, eliminating the TTY's last excuse for being. Unfortunately, the STAT utility included on CP/M system disks still thinks a TTY should be the default computer console.

Logical and Physical Devices

With CP/M up and running, enter 'STAT DEV:'' and your console will display:

```
CON: IS TTY:
RDR: IS TTY:
PUN: IS TTY:
LST: IS TTY:
```

unless other assignments have been made. These are the default device assignments, with the ''logical'' devices listed in the left column and the assigned ''physical'' devices listed on the right. These assignments are mapped in the IOBYT, an eight-bit byte in memory location 0003. The use of the IOBYT and device names was inherited by CP/M from the Intel MDS (Microprocessor Development System) on which CP/M was originally created.

These are four logical devices as defined by the MDS Monitor program. The IOBYT is correspondingly divided into four two-bit fields, each containing a number (from zero through three) reflecting the assignment of one of four physical devices to each logical device. By changing the bit patterns in these fields, different input or output devices can be selected to perform the functions of the operator's console (CON:), tape reader (RDR:), tape punch (PUN:) or listing device (LST:).

The old ASR-33 TTY, with its keyboard, printer, paper tape punch and paper tape reader, could fulfill all the tasks necessary for program entry, listing, saving and operator control. Hence the default assignment of all these logical functions to the TTY.

Now that we have been spoiled by inexpensive peripheral hardware, a typical microcomputer system will have a CRT terminal as the console device and a line printer as the list device, and programs will be loaded from and saved on a disk or two. On a system with no other peripheral devices available, the use of the IOBYT addressed through STAT is not necessary, as device assignments will never vary.

But as soon as you start hanging more goodies on your system, like a remote terminal by the pool, or a modem for talking with other computers, or a cartridge tape for disk back-up, you will find that the flexibility provided by the use of the IOBYT will prove to be valuable indeed.

You will also find that the default device names don't make much sense, unless you are working on one of those MDS systems. So, let's see how we can change the names to suit the modern environment.

Changing Device Names

Example 1 shows the console display that results when you enter 'STAT VAL:'' to find all the legal physical devices that can be assigned to the four logical devices. TTY: and CRT: and LPT: should be familiar, and it doesn't take too much imagination to figure out that PTR: and PTP: stand for paper tape reader and paper tape punch, the high-speed options on the MDS to replace the ten-character-per-second devices on the TTY.

The other names don't tell us much. BAT: is a special operating mode available on the MDS system for BATCH processing, and BAT: must use specific devices. In the batch mode the RDR: device is read by the MDS monitor as the console, so a tape with a string of operator com-

```
A>STAT VAL:

CON: = TTY: CRT: BAT: UC1:
RDR: = TTY: PTR: UR1: UR2:
PUN: = TTY: PTP: UP1: UP2:
LST: = TTY: CRT: LPT: UL1:
A>
```

Example 1. Calling CP/M's STAT program with a parameter of ''VAL:'' results in the display of the four physical device names available for assignment to each of the four logical devices. These are the names we will be modernizing by use of the techniques explained in the article.

Address correspondence to Ken Barbier, PO Box 1253, Borrego Springs, CA 92004.

mands can be read and processed, much like a CP/M SUBMIT file. But since this is a paper tape operation through the MDS Monitor, BAT: is meaningless in a non-MDS environment, which the overwhelming majority of CP/M installations certainly are.

UC1: stands for a user-definable console device number 1. UR1: and UR2; are user reader 1 and 2 options. These are not very meaningful names, so let's change them to what makes sense on our own system.

Example 2 is a printout of the console messages that resulted from a STAT program device renaming session. First, DDT was loaded and directed to load (but not execute) STAT.COM. Next, we dumped the first 90H (90 in hexadecimal) locations. DDT happily lists not only the hex values for each memory location, but their ASCII equivalents as well.

This convenient display allows us to instantly spot the memory locations where STAT has stored the names of both the logical and the physical devices. To change the names of either, or both, simply change the entries in the block of memory beginning at location 012AH for logical devices, or 0142H for physical devices. Simple. STAT will set up the IOBYT two-bit fields according to the sequence of the names, and will not pay any attention to the names themselves, provided that all

```
A>DDT
DDT VERS 1.4
-ISTAT.COM
-R
NEXT  PC
0D00 0100
-D0100,18F
0100 C3 24 02 20 20 20 43 4F 50 59 52 49 47 48 54 20 .$.   COPYRIGHT
0110 28 43 29 20 31 39 37 38 2C 20 44 49 47 49 54 41 (C) 1978, DIGITA
0120 4C 20 52 45 53 45 41 52 43 48 43 4F 4E 3A 52 44 L RESEARCHCON:RD
0130 52 3A 50 55 4E 3A 4C 53 54 3A 44 45 56 3A 56 41 R:PUN:LST:DEV:VA
0140 4C 3A 54 54 59 3A 43 52 54 3A 42 41 54 3A 55 43 L:TTY:CRT:BAT:UC
0150 31 3A 54 54 59 3A 50 54 52 3A 55 52 31 3A 55 52 1:TTY:PTR:UR1:UR
0160 32 3A 54 54 59 3A 50 54 50 3A 55 50 31 3A 55 50 2:TTY:PTP:UP1:UP
0170 32 3A 54 54 59 3A 43 52 54 3A 4C 50 54 3A 55 4C 2:TTY:CRT:LPT:UL
0180 31 3A 20 49 53 20 24 20 3D 24 42 41 44 20 44 45 1: IS $ =$BAD DE
-INEWSTAT.HEX
-R
NEXT  PC
0D00 0000
-D0100,18F
0100 C3 24 02 20 20 20 43 4F 50 59 52 49 47 48 54 20 .$.   COPYRIGHT
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0120 4C 20 52 45 53 45 41 52 43 48 43 4F 4E 3A 52 44 L RESEARCHCON:RD
0130 52 3A 50 55 4E 3A 4C 53 54 3A 44 45 56 3A 56 41 R:PUN:LST:DEV:VA
0140 4C 3A 43 52 31 3A 43 52 32 3A 53 20 31 3A 53 20 L:CR1:CR2:S 1:S
0150 32 3A 53 20 31 3A 53 20 32 3A 50 20 31 3A 43 4F 2:S 1:S 2:P 1:CO
0160 4E 3A 53 20 31 3A 53 20 32 3A 50 20 31 3A 43 4F N:S 1:S 2:P 1:CO
0170 4E 3A 4C 50 54 3A 53 20 31 3A 53 20 32 3A 43 4F N:LPT:S 1:S 2:CO
0180 4E 3A 20 49 53 20 24 20 3D 24 42 41 44 20 44 45 N: IS $ =$BAD DE
-G0

A>SAVE 12 NEWSTAT.COM
NEWSTAT VAL:

CON: = CR1: CR2: S 1: S 2:
RDR: = S 1: S 2: P 1: CON:
PUN: = S 1: S 2: P 1: CON:
LST: = LPT: S 1: S 2: CON:
A>NEWSTAT DEV:
CON: IS CR1:
RDR: IS S 1:
PUN: IS S 1:
LST: IS LPT:

A>NEWSTAT LST:=CON:

A>NEWSTAT DEV:
CON: IS CR1:
RDR: IS S 1:
PUN: IS S 1:
LST: IS CON:
```

Example 2. The console display resulting from a session that replaces the default physical device names with more meaningful designations. DDT is first used to load STAT.COM, dump the first 90H locations, and then read in NEWSTAT.HEX which overlays the physical device name area at the beginning of the program. Another dump verifies this overlay. DDT then re-boots CP/M (Go to 0) and SAVE is used to create a file consisting of the customized NEWSTAT program. NEWSTAT now operates with the updated device names, as is shown at the bottom of this printout.

names remain three characters and a colon.

Listing 1 is a CP/M ASM printout of a program that would fill the physical device field (0142H through 0181H) in STAT with the names that already exist. It was assembled as a test, to make sure that the correct locations were covered. Listing 2 is the program that was actually used to change all of the names to suit my system, which includes two memory-mapped video display modules (VDM), two serial I/O ports, two parallel ports and a dedicated port for the line printer.

```
0142                    ORG     142H

                ; CON:
0142 5454593A           DB      'TTY:'
0146 4352543A           DB      'CRT:'
014A 4241543A           DB      'BAT:'
014E 5543313A           DB      'UC1:'

                ; RDR:
0152 5454593A           DB      'TTY:'
0156 5054523A           DB      'PTR:'
015A 5552313A           DB      'UR1:'
015E 5552323A           DB      'UR2:'

                ; PUN:
0162 5454593A           DB      'TTY:'
0166 5054503A           DB      'PTP:'
016A 5550313A           DB      'UP1:'
016E 5550323A           DB      'UP2:'

                ; LST:
0172 5454593A           DB      'TTY:'
0176 4352543A           DB      'CRT:'
017A 4C50543A           DB      'LPT:'
017E 554C313A           DB      'UL1:'

0182                    END
```

Listing 1. A test program assembled and loaded on top of STAT to verify the overlay technique used to change the device names.

```
0142                    ORG     142H

                ; CON:
0142 4352313A           DB      'CR1:'
0146 4352323A           DB      'CR2:'
014A 5320313A           DB      'S 1:'
014E 5320323A           DB      'S 2:'

                ; RDR:
0152 5320313A           DB      'S 1:'
0156 5320323A           DB      'S 2:'
015A 5020313A           DB      'P 1:'
015E 434F4E3A           DB      'CON:'

                ; PUN:
0162 5320313A           DB      'S 1:'
0166 5320323A           DB      'S 2:'
016A 5020313A           DB      'P 1:'
016E 434F4E3A           DB      'CON:'

                ; LST:
0172 4C50543A           DB      'LPT:'
0176 5320313A           DB      'S 1:'
017A 5320323A           DB      'S 2:'
017E 434F4E3A           DB      'CON:'

0182                    END
```

Listing 2. The program actually used to create the updated physical device names in the customized NEWSTAT program. The origin (ORG 142H) must correspond to the correct location in STAT.COM as loaded by DDT, and each name must consist of three characters and ":" for the overlay to operate properly.

My system includes two memory-mapped video display modules (VDM), two serial I/O ports, two parallel ports and a dedicated port for the line printer.

As can be seen from Listing 2, I can select either VDM or a terminal connected to either serial port as the console. Punch and reader functions can be accessed through either serial port, or parallel port 1. Parallel port 2 is actually the port dedicated to the line printer, so it is named LPT: and not used for any function other than listing.

Now I can use STAT to re-assign devices using names meaningful to me. Fig. 1 shows the device assignment fields in the IOBYT and the new names for the options.

But you may ask, what is this "CON:" doing as a physical device? CON: is the console, a logical device which can be any one of the four physical device choices we discussed above. How can a logical device be a physical device?

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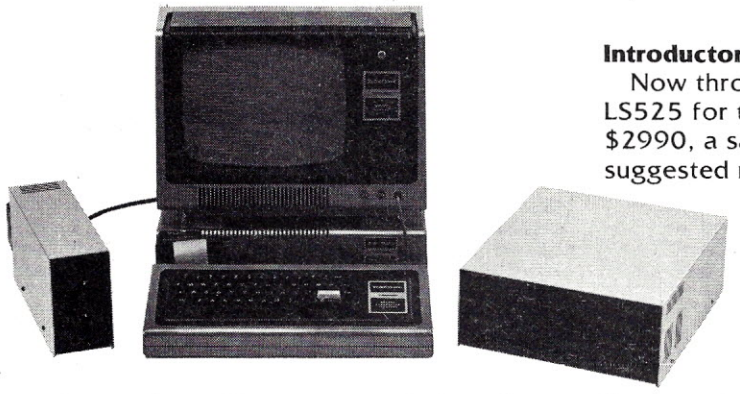

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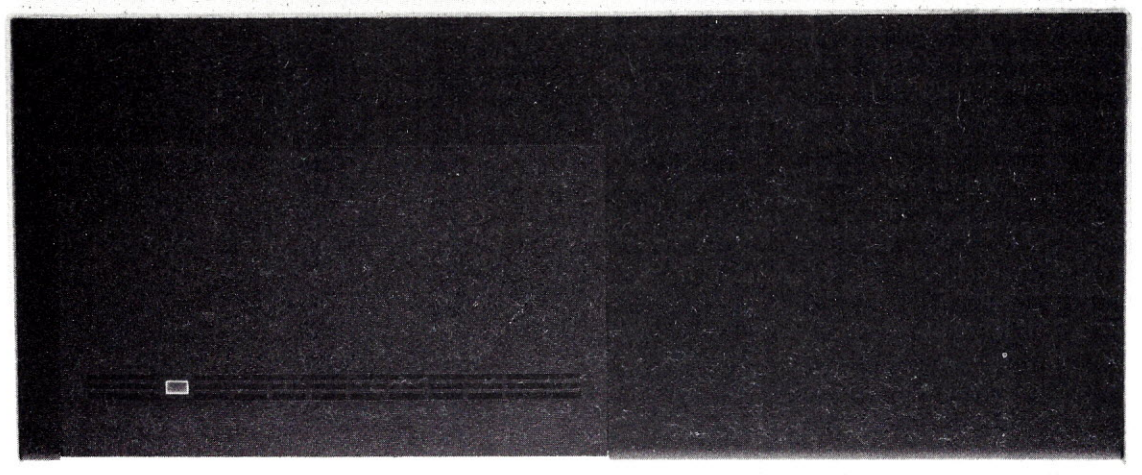

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Suppose you were using a modem to send and receive files from your CP/M disk to another computer. The modem could be connected to serial port 2, so "S 2" should be assigned to both PUN: and RDR: and PIP can be used for transfers; "PIP PUN:=FILENAME.TYP", for example. Before tying up the phone for a half hour to make this transfer over a 300 baud modem, we might want to take a quick peek at what that PIP command line will produce. So we assign "STAT PUN:=CON:" for a quick test run, and what will later go out over the modem will now be seen on the console device—whichever physical console device is currently assigned!

This last technique is made practical by the fact that most computers will not have four different punch, reader or list devices, so at least one option each is left over in the IOBYT assignments. I happen to like to be able to use the console to screen what is happening to the other devices, so I included this option in my customized basic I/O system (CBIOS).

A Customized STAT Is Not Enough

Aha! There's the catch. Changing the names of devices in STAT won't accomplish anything unless our CBIOS makes use of the IOBYT. The *CP/M System Alteration Guide* gives instructions and examples that permit generating a minimum CBIOS. But to make use of the device assignment flexibility inherent in STAT and the use of the IOBYT, more than the minimum CBIOS is required. Don't panic—writing the required routines is not at all hard.

Listing 3 is the punch logical device driver routine portion of the CBIOS in my system. In only 38H bytes, the PUN: device field of the IOBYT is extracted and decoded, and the character being sent to logical device PUN: is output to the proper physical device. Included in this listing are three subroutines (S1OUT, S2OUT and P1OUT) that can be called directly as physical device drivers. This eliminates the need for duplicating this much of the code when writing the CON: and LST: routines, which use these ports as well.

In this program example, the IOBYT is loaded into the A register, the desired two-bit field is shifted down to the least-significant bits, the rest of the IOBYT zeroed by the ANI 3 instruction and the remainder is tested for zero. If it is zero, we output our character to serial port 1, the first entry in the PUN: field in STAT.

Otherwise, we decrement A to see if it was a one, and so on. Note that since the character to be sent is in the C register on entering the PUN: driver, the A register is free to be used both for decoding the IOBYT and testing the output port ready status. No other registers are needed.

Using this listing as a guide, similar routines can be easily written for the other input and output devices.

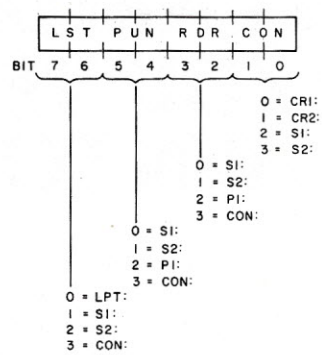

Fig. 1. The IOBYT in memory location 3. NEWSTAT changes the contents of the four two-bit fields corresponding to each logical device. CBIOS must read the IOBYT to implement the assignments.

Get Started Coding

With a quick patch to STAT and the writing of a little more code for CBIOS, efficient use of the flexibility built into the concept of the IOBYT can be made on any system having more than the minimum number of I/O devices. What better excuse for going out and buying that modem you want, and the speech synthesizer, and a terminal for the patio, and. . . ■

```
                ; 32 K CP/M CBIOS PUN: ROUTINE

0088 =          S1STAT  EQU     88H             ; UART 1 STATUS PORT
0089 =          S1DATA  EQU     89H             ; UART 1 DATA PORT
008A =          S2STAT  EQU     8AH             ; UART 2 STATUS PORT
008B =          S2DATA  EQU     8BH             ; UART 2 DATA PORT
0081 =          UARTM   EQU     81H             ; TX EMPTY AND DSR
008E =          P1STAT  EQU     8EH             ; PARALLEL PORT STATUS
009F =          P1DATA  EQU     9FH             ; PARALLEL PORT DATA
0040 =          P1RDY   EQU     40H             ; PARALLEL PORT READY

0003 =          IOBYT   EQU     3               ; I/O BYTE IN RAM

7E0C =          CONOUT  EQU     7E0CH           ; CONSOLE OUTPUT

F90C                    ORG     0F900H          ; PROM LOCATION

F900 3A0300     PUN:    LDA     IOBYT           ; SEE WHICH DEVICE
F903 0F                 RRC                     ; IS THE PUNCH NOW
F904 0F                 RRC                     ; SHIFT BITS DOWN
F905 0F                 RRC
F906 0F                 RRC
F907 E603               ANI     3               ; MASK PUN: BITS
F909 C219F9             JNZ     PUN1            ; IS IT UART 1?
F90C DB88       S1OUT:  IN      S1STAT          ; YES, WAIT FOR READY
F90E E681               ANI     UARTM           ; MASK TX READY BITS
F910 FE81               CPI     UARTM           ; BOTH MUST BE ON!
F912 C20CF9             JNZ     S1OUT
F915 79                 MOV     A,C             ; READY, OUTPUT BYTE
F916 D389               OUT     S1DATA
F918 C9                 RET                     ; AND ALL DONE
F919 3D         PUN1:   DCR     A
F91A C22AF9             JNZ     PUN2            ; IS IT UART 2?
F91D DB8A       S2OUT:  IN      S2STAT          ; SAME AS UART 1
F91F E681               ANI     UARTM
F921 FE81               CPI     UARTM
F923 C21DF9             JNZ     S2OUT
F926 79                 MOV     A,C
F927 D38B               OUT     S2DATA
F929 C9                 RET
F92A 3D         PUN2:   DCR     A               ; IS IT PARALLEL PORT?
F92B C20C7E             JNZ     CONOUT          ; NO, MUST BE CON:
F92E DB8E       P1OUT:  IN      P1STAT          ; PARALLEL PORT OUTPUT
F930 E640               ANI     P1RDY
F932 CA2EF9             JZ      P1OUT           ; WAIT FOR NOT BUSY
F935 79                 MOV     A,C             ; THEN SEND THE BYTE
F936 D39F               OUT     P1DATA
F938 C9                 RET                     ; AND ALL DONE

F939                    END
```

Listing 3. The listing of the "PUN:" logical device driver in CBIOS. The routine makes use of the PUN: two-bit field within IOBYT (memory location 3) to direct the character to be "punched" to the physical device corresponding to the assignment made by NEWSTAT. This program also implements the logical-to-logical assignment "PUN:=CON:" as discussed in the article.

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It starts with good program design—through the use of hierarchy charts and pseudocode.

How to Write A Computer Program

By David Carew

Successful computer programs are based on good design, and good design results from careful analysis of the problem involved. By breaking the problem down into its basic components, the programmer can examine and solve each component individually.

Thus the beginner increases his skill and confidence with each small success, and soon gains the experience to program relatively ambitious and complex projects. He avoids becoming locked into a morass of interlocking bugs and prolonged frustration that might discourage him from trying anything else.

Generally, program design problems separate into two areas of concern: computer processes and data. The programmer must work with the structure and relationship of these to produce the desired result. Their relative importance depends on the specific "desired result."

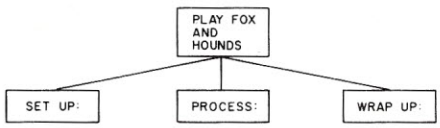
For example, a program which prints a report from an existing data file onto a preprinted form should be designed around the input and output data structures, while a game should be designed by creating data structures to fit the game process. Any program design problem can be solved by concentrating first on one of these concerns and then on the other, bringing conclusions and discoveries from one area to the other.

Two good tools for defining program processes are hierarchy charts and pseudocode (pseudocode is a language for communicating programming ideas to people; it is not intended to compile or interpret on a computer). Typical design aids for managing data are data flow and data structure diagrams.

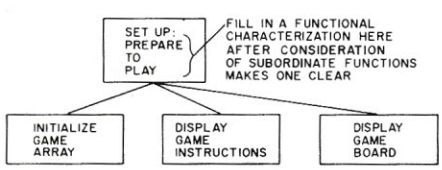
Notice I don't mention flowcharts. Flowcharts have traditionally been the first design tool taught the budding programmer. They have convinced many people that design is a waste of time, because a good portion of a design effort using flowcharts usually goes to waste. Flowcharts, while useful as documentation after the fact, are poor design tools. Because of their clarity, flowcharts are excellent for communicating a finished idea, but hierarchy charts are nearly as good at communicating, and much better at aiding the design process.

Incidentally, one reason for the current excitement about Pascal is that it can be used as a kind of pseudocode which, because the computer

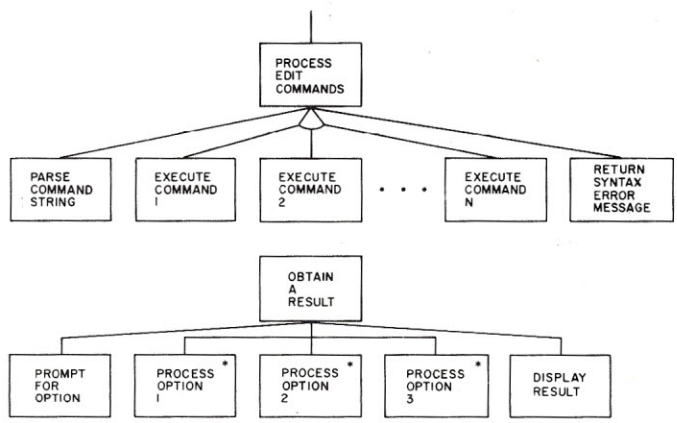
David Carew is a software project team leader for Interactive Management Systems Corp., 3700 Galley Road, Colorado Springs, CO 80909.



Example 1. First-level decomposition of a possible game program in hierarchy chart form.



Example 2. The leftmost (SET UP) box of Example 1 might further decompose like this. The diamond on the middle box indicates selection (i.e., the game instructions may or may not be selected for display).



Example 3. Two alternate indications of a selection control relationship (the "collector" shape in the top hierarchy chart and the asterisks in the bottom chart).

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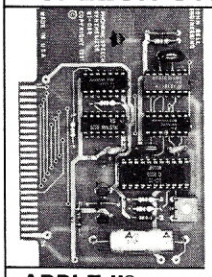

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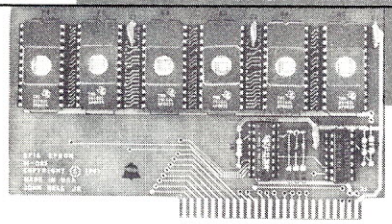

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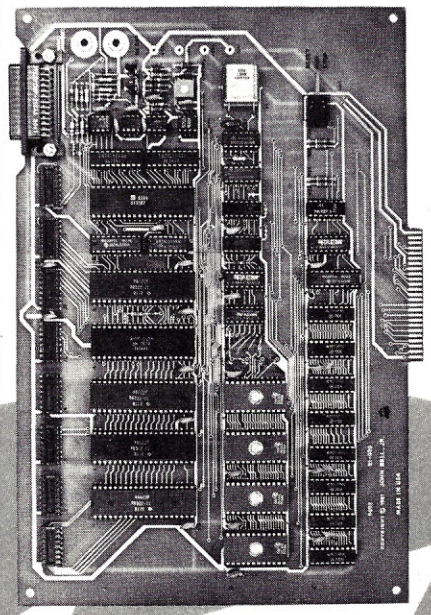

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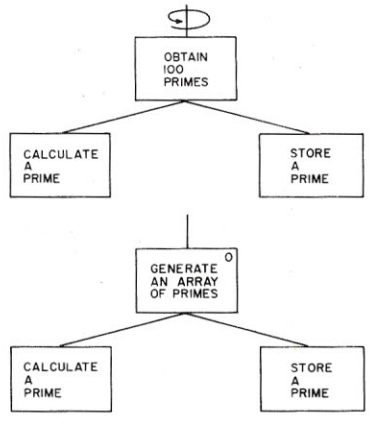
understands it too, is not really "pseudo." With Pascal, the hierarchy chart/pseudocode design method directly produces code that is executable on a machine and comprehensible to people.

Black Boxes

Hierarchy charting is much simpler than flowcharting. The idea is to examine the problem by stating the essentials of *what* must occur without considering *how* the computer makes it occur. Each box you draw is a black box; you can state with precision what happens when you cue the box to action under given circumstances, but you don't know, or care, how. We all know what hierarchy charts look like because we have all seen the ubiquitous organization chart. Every human confluence involving more than ten people and lasting more than two months seems to require one.

To begin, draw a box at the top middle of a blank sheet of paper. State the function of the proposed system as an action verb and a simple object. The unstated subject is the program or system, and the goal is to strip the statement down to absolute essentials. If you were designing a car, you might think "this car moves people and objects." Then you would write in the box: "move people, objects." If you were designing a program to play the checkerboard game of Fox and Hounds, you might think "this program plays Fox and Hounds games," and you might write "play Fox and Hounds."

Then draw three boxes across the page, below the first box. Label the leftmost box *set up*, the middle box *process*, and the rightmost box *wrap up*. Connect the boxes with lines like those on an organization chart. What you have will look like Example 1.



Example 4. Two alternate indications of iteration are illustrated in these hierarchy charts. I prefer the graphic "looping arrow" method.

Then break down each subordinate box into essential functions, again trying to state each function with one action verb and a simple object. This is called functional decomposition, a topic inspiring much controversy over the comparative economics and aesthetics of alternative decompositions of a problem.

For the beginner, even the worst possible decomposition provides some insight into the problem, and gives him a point of departure for examining data flow and data structure. This examination affords him further insight into process functions, which results in a more accurate hierarchy breakdown. A few such iterations will result in a precise view of what the program code must be like to cleanly and efficiently produce a desired result.

Our Fox and Hounds process called set up might decompose into *initialize game arrays, display game instructions*, and *display game board*. You soon run

into the question of how to express control relationships among the functions you explicate. For instance, you might wish to display game instructions only upon the user's request, and skip the function otherwise.

Control Notation

Three basic control interrelationships are needed to express any algorithm: sequence, selection and iteration. In hierarchy charting, sequence is generally top to bottom, left to right. Selection is often shown as a small diamond or a small collector on the hierarchy line. Alternatively, a process or function related to its higher level by selection is sometimes denoted by an asterisk (*) in its box. Example 2 uses the diamond to illustrate that the process called display game instructions may or may not be selected as part of the prepare to play process. Example 3 illustrates the collector and asterisk conventions. Iteration may be designated by a looping arrow graphic or by an alpha O in the hierarchy box, as in Example 4.

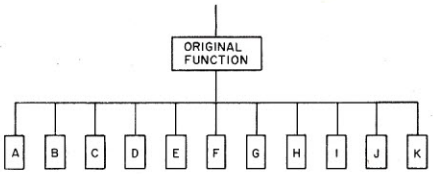
The idea is to designate control relationships, not to precisely specify control flow as you must in flowcharting. Before decomposing any box through creative insight or intuition, it is generally a good idea to draw a three-box underlevel and label the boxes by formula: input–process–output, set up–process–wrap up, begin–execute–finish, or something to this effect.

Similarly, if after attacking some problem you find yourself contemplating a single level of hierarchy 12 or 14 boxes wide, chances are you are trying to do too much all at once. Such a situation is illustrated in Example 5a. Some of those 11 boxes probably belong on other levels—the formula of three, above, is your key to putting things in their place.

IBM calls this trick HIPO, for hierarchical–input–process–output. Much of IBM's system software, which is probably the most extensively used software in the world, was created using HIPO techniques.

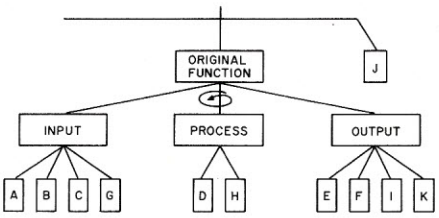
Conclusion

Hierarchy charts get at the skeleton of a problem, and pseudocode fleshes in its solution. Data flow and data structure design provide the lifeblood and nervous system of your program. Each has its tools and its place in the design cycle, permitting the programmer to gain successively deeper insight with each iteration of the cycle.■



ABOVE IS PROBABLY THE WRONG DECOMPOSITION; THE FOLLOWING MAY RESULT FROM RE-CONSIDERATION:

Example 5a. This is probably the wrong decomposition. Too many functions all have the same level.



Example 5b. This may result from reconsideration according to the "rule of three"—input-process-output.

↙See List of Advertisers on page 242

If you yearn for letter-quality word processing on your North Star, here's a devil-of-a-good printer interface.

Expand Your Horizon

By J. K. Schweppe

I bought a Diablo 1345A OEM parallel interface printer for about $1000 less than the corresponding serial model, which brought me into the dot-matrix price range. But the 1345 requires three parallel ports and an operating program to make it work. Since my North Star Horizon has two parallel ports, I needed to add an interface.

I bought an I/O board with four parallel ports and started to interface the printer. This turned out to be more involved than I bargained for and ate up huge amounts of my time. Wiring the cable to the printer with its 50 conductors was not so bad, but learning enough to make the software run was another thing. It took so long I feared that I would never get the printer running.

Now MicroPro (1299 Fourth St., San Rafael, CA 94901) has come to my rescue with their I/O Master interface board and software. The board contains four parallel ports, two serial ports with data buffers and other features. It can be connected to your terminal, modem, daisywheel printer and line printer simultaneously. It connects to the Diablo with a plain 50-conductor ribbon cable and to your CRT and modem via a ribbon cable terminating in two EIA RS-232 connectors.

My dealer obtained my I/O Master configured for North Star. Installation thus involved only setting the DIP switches, plugging in the board, connecting the printer and CRT and installing the software.

Documentation delivered with the board is thorough; it fills a 3/4-inch ring binder.

The I/O Master software loads on top of Lifeboat Associates' CP/M2. If you have WordStar you already have the Diablo driver. Just reinstall using the INSTALL command as described in the I/O Master documentation.

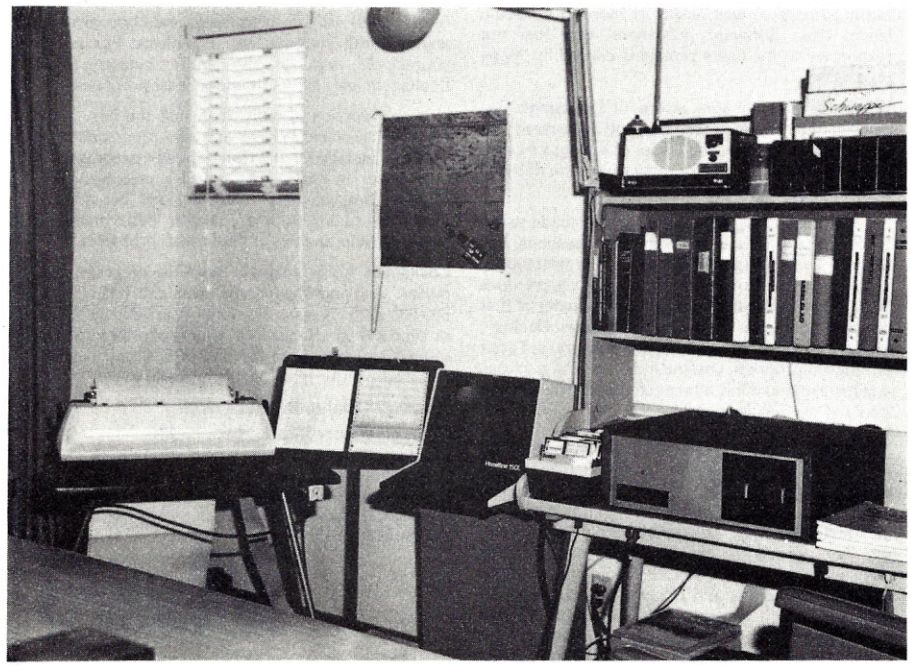
WordStar makes the Diablo perform. In addition to format, justify, underline, boldface and other controls in the WordStar system, the Diablo driver routine prints bidirectionally and produces beautiful, evenly-spaced printing.

If you are using PIP to print, you need to add a driver routine to CP/M. MicroPro can provide a file called USERNS.ASM. You edit six lines of assembly options and assemble USERNS.ASM in place of USER.ASM in the Lifeboat CP/M2 operating system. I used WordStar to edit the assembly options (see Table 1).

Using your operating copy of CP/M, assemble your edited version of USERNS.ASM by typing ASM USERNS, which produces USERNS.HEX and USERNS.PRN.

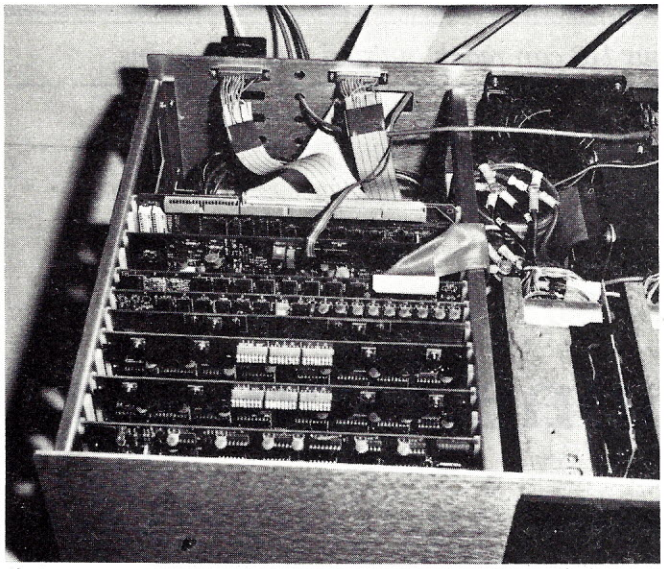
Overlay the USER part of the I/O routine using the SYSGEN procedure as follows:

1. A>SYSGEN <CR>
2. A>SAVE 40 CPM56.COM <CR>
3. A>DDT CPM56.COM<CR>

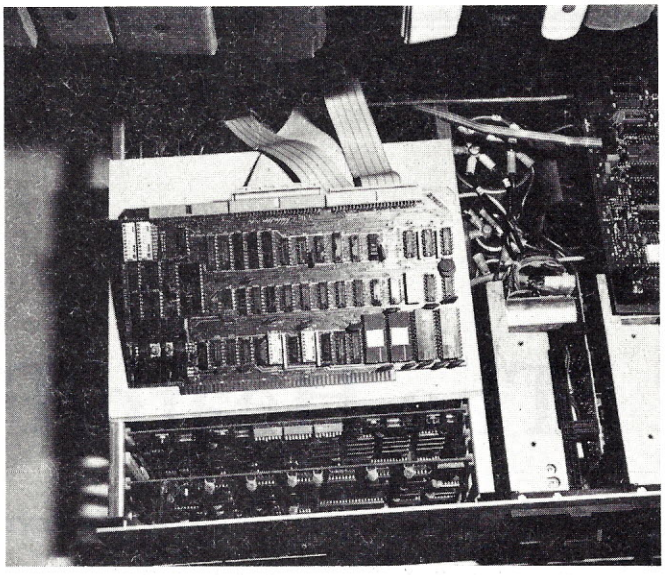


The workplace including North Star computer, Hazeltine CRT and Diablo printer.

Address correspondence to J. K. Schweppe, 2011 Key Blvd., Suite 3, El Cerrito, CA 94530.



The North Star with the I/O Master board installed in the last slot.



The I/O Master board.

4. A>H2700,5A00
5. -IUSERNS.HEX<CR>
6. -RCD00<CR>
7. -↑C
8. A>SYSGEN<CR>
9. A>SAVE 40 CPM.COM<CR>

This version causes the printer to print left to right only because the program space in BIOS is not large enough for a fully implemented Diablo driver. MicroPro now has a new software program called Spinware which loads itself above CP/M, patches itself into CP/M and operates the Diablo through the I/O Master to print bidirectionally.

Two serial ports on the I/O Master are equipped with 32-byte buffers, which reduce the chance of dropping characters during disk access. I highly recommend their use; you simply change your CRT cable from the North Star left serial port to the I/O Master serial port.

MicroPro can supply a cable that plugs into their I/O board and terminates in two EIA RS-232 connectors. These connectors mount on the backplane of your computer; your CRT plugs into the left one. Set the DIP switches on the I/O board and you are ready to run using the buffers. Now you can run your CRT at 19.2 baud. If you do not wish to use WordStar for printing, you can use one of the CP/M PIP commands, such as PIP LST: = B:filename.tex.

There is a small problem when you want to run your North Star DOS. The NSDOS expects the CRT to be at device 0, but you are plugged into I/O MASTER device 0. You now have the choice of plugging your CRT back into the North Star motherboard left serial port or rewriting your DOS. I'm still plugging the CRT back and forth.

Conclusion

The system works to my complete satisfaction. It still functions with North Star DOS and CP/M for writing programs and with other application programs.

While adding the printer I have learned a good deal about hardware, operating systems and I/O routines, but not enough to write my own I/O routines from scratch. I've learned that I can buy commercially available hardware, operating systems and application programs, put them together and produce a computer system that will do what I want.

I haven't written an I/O routine to interface the Diablo, which rankles me. But then, I don't know how to design and manufacture integrated circuits, either. ■

```
; ASSEMBLY OPTIONS
;
MSIZE     EQU   56      (NO CHANGE)          ;SET TO SYSTEM SIZE IN K-BYTES
MPARITY   EQU   FALSE   (NO CHANGE)          ;TRUE FOR MEMORY PARITY OPTION
DIABLOB   EQU   FALSE   (CHANGE TO TRUE)     ;TRUE FOR PARALLEL DIABLO
CENTRON   EQU   TRUE    (CHANGE TO FALSE)    ;TRUE FOR CENTRONICS PRINTER
BOARD     EQU   TRUE    (NO CHANGE)          ;TRUE FOR NORTH STAR MOTHERBOARD
SER2      EQU   TRUE    (NO CHANGE)          ;TRUE FOR SECOND I/O MASTER
                                             ; SERIAL PORT AS PUNCH AND
                                             ; READER, DEFAULTS TO FIRST PORT
```

Table 1.

↙See List of Advertisers on page 242

With this easy-to-build Tele-Pulse circuit, your H8 can reach out and touch someone.

The Heath/Phone Hookup

By Raymond Massa

Tele-Pulse is an inexpensive circuit that lets you turn your H8 computer into a sophisticated automatic phone dialer.

It permits manual or automatic dialing, lets you search for a name and dial out its associated phone number, has a redial feature if the line is busy, can alphabetize names in the directory and includes automatic dialing of a common category. All data is stored in memory for fast access times.

Tele-Pulse is designed for use with either an H8-5 serial/cassette board or an H8-4 four-port board, and fits into the H8 mainframe. It works with either touch-tone or standard rotary-dial lines, and requires only a simple three-wire connection to your phone. Power for the circuit comes from the particular serial port board that you choose to connect it to.

All connections to the Heath boards are done using a header socket. A 16-pin socket is used for the H8-5 board version, and plugs into IC socket U118/U121. The H8-4 version uses only half of the 16-pin header socket, and plugs into socket U5 of the four-port board. Tele-Pulse does not use up a slot on the motherboard.

Pulsing frequency is ten pulses a second to assure compatibility with all phone lines. Interdigit pause is 750 ms. Both of these times are software-controllable.

Address correspondence to Raymond Massa, 125 Aspen, Birmingham, MI 48009.

You can incorporate Tele-Pulse into your own programs by inserting one of the two routines provided here. Or you can use the circuit strictly as an automatic phone dialer/directory, using the program at the end of this article, to completely drive Tele-Pulse.

Assembly Instructions

Assembly of the Tele-Pulse circuit is simple and straightforward. A printed circuit board helps eliminate possible wiring errors.

But if you would like to make your own board, a negative pattern of the

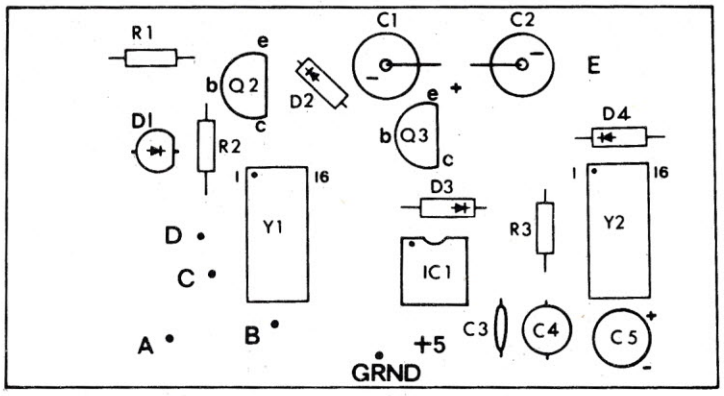


Fig. 1. H8-5 version: top view.

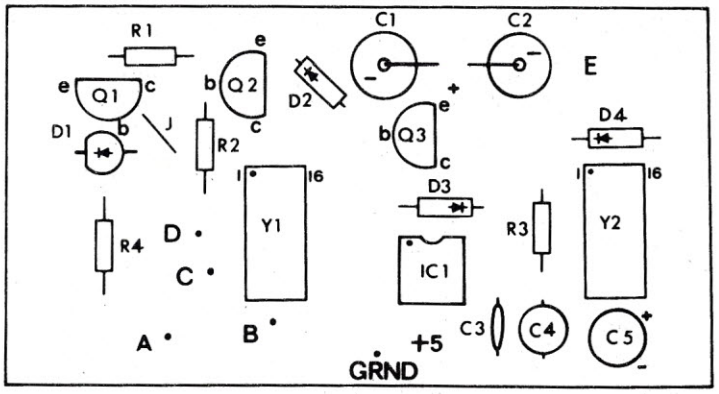


Fig. 2. Four-port version: top view.

artwork is shown in Fig. 4. All of the components are available through Radio Shack stores.

First determine which interface card you intend to use with Tele-Pulse—the H8-4 four-port board or the H8-5 cassette/serial board. One jumper wire must be added to the H8-4 board and two to the H8-5 board.

The printed circuit pattern shown in Fig. 4 is the actual size. I recommend that you use this to construct the circuit, since assembled and tested units do work reliably using this artwork. If you do not, however, I suggest that you at least use Figs. 1 and 2 for a parts layout scheme. Then refer to the schematic drawing for your wiring instructions.

If you have decided to use the H8-5 board for the interface, refer to Fig. 1 during assembly. There will be extra holes on the circuit board in this version that will not be used. If you are going to use the H8-4 board, refer to Fig. 2 for the placement of components. Note that in this version you'll need two parts that are not needed in the H8-5 version. They are Q1 and R4 and are listed in the parts list.

Mount D1 (light emitting diode), being certain to position the flat of the LED correctly. Note that in the H8-4 port version, D1 is in a different location. Next mount the remaining diodes, being certain that the banded end matches the markings in the diagram. Then mount all transistors, the integrated circuit socket, all capacitors and finally the relays. Sockets are not necessary for the relays, since it is very unlikely that they would be damaged should the circuit be wired wrong. The 555 IC, however, should be socketed.

If constructing the H8-4 version, be sure to install the jumper wire where indicated in Fig. 2 near the upper left-hand corner of the diagram. Be careful to position IC1, as well as the electrolytic capacitors, correctly. When inserting the transistors, match the markings on the transistor leads with those of the parts placement diagram.

Next, refer to Fig. 3 for the header socket wiring diagram. Use the appropriate drawing as a guide (H8-4 or H8-5) when attaching the four-wire cable. The H8-4 version requires only three wires for operation, and the header socket must be cut at the point indicated in Fig. 3 so that it will fit properly in the four-port serial board when plugged in. Make a note of the color coding of the wires at the header socket end, along with the letter or name designation of that wire.

Solder the wires to the header socket very carefully and quickly, so as not to melt the plastic form. Cut a small hole in the top piece of the header to accommodate the three or four wires that were just attached. Route the wires through the top shell, put a drop of plastic adhesive on the corners of the header base and snap on the top shell. Let this dry for several minutes.

Now attach the other end of the wires attached to the header socket to the PC board at the points indicated in Fig. 1 or 2. Note that pad B in Fig. 2 is not used for the H8-4 version. Refer to Fig. 3 and the notes that you made earlier when wiring the header socket to determine which color of wire represents the proper points on the circuit.

At this point you are finished with the circuit construction and wiring of

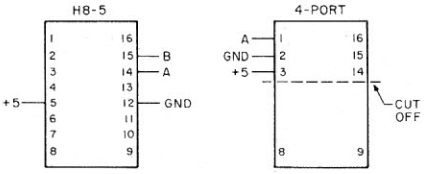


Fig. 3. Header wiring (top).

the cable. You must now add the jumper wire to the H8-4 board or the two wires to the H8-5 board, depending upon which board is being used. For the H8-4 version, connect an insulated jumper on the underside of the H8-4 board to pin 40 of IC socket 101. Connect the other end to pin 3 of IC socket 5 (U5). This will not affect normal operation of the board should Tele-Pulse ever be disconnected, so this jumper may be left in permanently.

If using the H8-5 board, install an insulated jumper wire on the underside of the board to the junction of R147–R148. Viewing the socket that houses ICs 119 and 121 from the front, count down five pins from the left-hand side of the socket and solder the other end of the jumper to this point on the reverse side. Install another jumper from the emitter (E) of

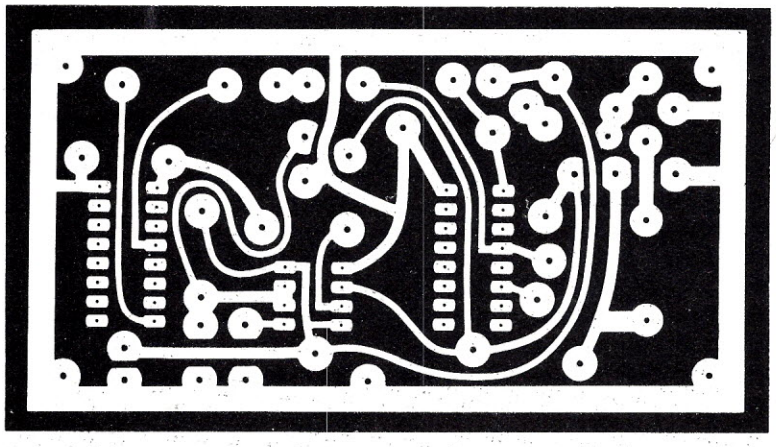
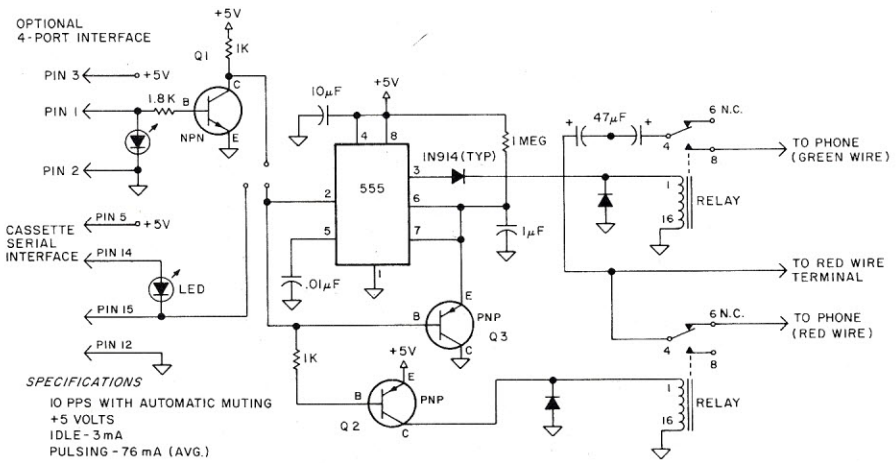


Fig. 4. Foil side.

✓See List of Advertisers on page 242

Resistors (1/4 watt)		Radio Shack#
R1,R2	1000 ohm	271-1321
R3	1 megohm	271-1356
R4	1800 ohm	271-1324
Capacitors		
C1,C2	47 uF (50WV) electrolytic	272-1015
C3	.01 ceramic disk	(272-1065) 272-131
C4	1 uF (25WV) electrolytic	(272-996) or 272-1406
C5	10 uF (25WV) electrolytic	272-1025
Diodes		
D1	light emitting diode	276-026 276-041
D2,D3,D4	1N914 (or 4148)	276-1122
Transistors		
Q1	NPN general purpose switching	(276-2016) 276-2009
Q2,Q3	PNP general puspose switching	(276-2023) 276-2024
Integrated Circuits		
IC1	555	276-1723
Miscellaneous		
Y1,Y2	5 V dc DIP relay	275-215
16-pin header		276-1980
8-pin IC socket		276-1995
4-conductor cable		278-372

Parts list.



Tele-Pulse schematic.

Q105. Viewing the socket that houses ICs 119 and 121 from the front again, count down five pins from the right-hand side of the socket and solder the other end of the jumper to this point on the reverse side. Note that no connection from either IC 119 or IC 121 is made at these points from the original circuit traces, so that no interference will occur with normal operation of the H8-5 board.

Now remove IC 119 and IC 121 on the H8-5 board if using this version, or remove IC 5 from the H8-4 board. These integrated circuits are not used when Tele-Pulse is installed. Do not discard them; they'll be needed if you ever desire to use the 20 mA current loop.

Now simply plug the header/wire assembly into the appropriate interface board. Make certain that you position the header correctly when inserting it into the unused IC socket. Refer to Fig. 3 for the top of the header, and position it toward the top of the Heath H8-4 and H8-5 board.

Install one wire from a four-wire piece of cable to point D on the Tele-Pulse PC board. Connect the other end of this wire to the screw terminal on your phone that has a red wire from the phone cable going to it. Disconnect this red wire and connect one end of one of the other wires in the four-wire cable to this red wire. Use a connector cap to twist and insulate these two wires together, or solder and securely tape the bare connection. The other end of this wire goes to point C on the Tele-Pulse circuit board.

```
10 REM      ******* TELE-PULSE *******
20 REM         Written by Ray Massa
30 REM              Version 1.1
40 REM              Apr.30,1981
50 REM      *************************
60 REM
70 REM
80 REM      THIS IS THE TELE-PULSE DRIVER ROUTINE
90 REM      NECESSARY FOR THE CIRCUIT TO OPERATE.
100 REM      INCORPORATE THIS IN USER WRITTEN PROGRAMS
110 REM      SO THAT TELE-PULSE MAY BE ACCESSED BY
120 REM      AS MANY PROGRAMS AS DESIRED.
130 REM
140 REM
150 REM      THIS VERSION IS FOR THE H8-5 CASSETTE/SERIAL BOARD.
160 REM
170 REM      1) COPY THE FILE ATH85.DVD ON THE DISK YOU WILL USE.
180 REM      2) RENAME THIS FILE TO H5.DVD
190 REM      3) USE THE SET COMMAND TO CONFIGURE THE PORT
200 REM            ADDRESS AT 376 (254 DECIMAL).
210 REM      4) CONFIGURE THE CASSETTE/SERIAL BOARD TO 600 BAUD.
220 REM            (LABELED SER RX, SER TX -- CHANGE BOTH TO 600)
240 REM
250 REM      IMPORTANT!  REMEMBER TO RECONFIGURE THE PORT ADDRESS ON
260 REM                  THE CASSETTE/SERIAL CARD BY MOVING THE JUMPER
270 REM                  WIRE TO THE PROPER HOLE. (WIRE MARKED X ON
280 REM                  UPPER RIGHT HAND CORNER OF BOARD.)
290 REM
300 REM
310 REM
320 REM
330 OPEN "H5:" FOR WRITE AS FILE #1
340 CLOSE #1
350 PRINT CHR$(27);"E"
360 PRINT :PRINT :PRINT
370 INPUT "ENTER NUMBER TO BE DIALED (NUMERALS ONLY)  ";A$
380 PRINT
390 PRINT CHR$(27);"p"
400 PRINT "PICK UP PHONE--WAIT FOR DIAL TONE AND HIT RETURN"
410 PRINT CHR$(27);"q"
420 PAUSE
430 PAUSE 500
440 L=LEN(A$)
450 FOR X=1TO L
455 Z1=VAL(MID$(A$,X,1))
456 IF Z1=0 THEN Z1=10
460 FOR Z=1 TO Z1
470 OUT 254,0
490 REM      IF RELAY IS PULSING, BUT CALL DOES NOT GO THROUGH,
500 REM      INCREASE OR DECREASE THE NUMBER IN THE PAUSE STATEMENT BELOW
510 REM      IN STEPS OF 2, UNTIL PROPER OPERATION IS ESTABLISHED.
530 PAUSE 30
540 NEXT Z
560 REM      REQUIRED INTERDIGIT TIME IS 750 MILLISECONDS
570 REM      DO NOT ALTER THE NUMBER IN THE PAUSE STATEMENT BELOW
590 PAUSE 375
600 NEXT X
610 PRINT "DIALING HAS BEEN COMPLETED....."
620 PRINT :PRINT
630 GOTO 360
640 END
```

Software driver routine (version 1.1).

Finally, connect a third wire from the four-wire cable to point E on the circuit board, and connect the opposite end to the screw terminal on the phone that has a green wire going to it. This green wire would be in the same phone cable that the red wire was in. Leave the green wire connected to this terminal. If colors other than green and red are used from the phone cable to the phone, follow this cable to the inside of the telephone and note the color of the wires that connect to the two terminals. Simply substitute either of these wires for the red or green wire and label it. Do the same for the other remaining wire. Then proceed according to the previous instructions, using the labels, rather than colors, as identifiers.

Now proceed to the proper BASIC program listing for operation and software driver configuration needed to operate Tele-Pulse. Then proceed to the DIRECTORY documentation.

This program runs under Benton Harbor Disk BASIC and was written for the H8-H19, or H-89 computer system. Because this program uses the special cursor functions available to the H19 terminal, modification would be required to operate with an H9. The requirements for this program are 32K of memory and at least one disk drive.

Introduction

DIRECTORY is a multifunction program that lets you turn your computer into a sophisticated automatic phone dialer when used in conjunction with the Tele-Pulse electronic

```
10 REM      ******* TELE-PULSE *******
20 REM         Written by Ray Massa
30 REM             Version 2.1
40 REM             Apr.30,1981
50 REM      **************************
60 REM
70 REM
80 REM      THIS IS THE TELE-PULSE DRIVER ROUTINE
90 REM      NECESSARY FOR THE CIRCUIT TO OPERATE.
100 REM      INCORPORATE THIS IN USER WRITTEN PROGRAMS
110 REM      SO THAT TELE-PULSE MAY BE ACCESSED BY
120 REM      AS MANY PROGRAMS AS DESIRED.
130 REM
140 REM
150 REM      THIS VERSION IS FOR THE H8-4 FOUR PORT SERIAL BOARD.
160 REM
170 REM      1) COPY EITHER THE LP.DVD OR ATH84.DVD DRIVER ON YOUR DISK.
180 REM      2) RENAME THIS FILE H4.DVD WHEN YOU COPY IT.
190 REM      3) USE THE SET COMMAND TO CONFIGURE THE PORT
200 REM            ADDRESS AT 300 (192 DECIMAL).
210 REM      4) USE THE SET COMMAND TO CONFIGURE THE BAUD RATE AT 300
230 REM
240 REM      IMPORTANT! Remember to set the RS-232/20 Ma switch
250 REM                 to the 20 Ma position.
260 REM                 Also, install the programming jumpers
270 REM                 on channel 0 of the four port board
280 REM                 for port 300. Channel 0 must be used
290 REM                 to interface Tele-Pulse.
300 REM
310 REM
320 REM
330 OPEN "H4:" FOR WRITE AS FILE #1
340 CLOSE #1
350 PRINT CHR$(27);"E"
360 PRINT :PRINT :PRINT
370 INPUT "ENTER NUMBER TO BE DIALED (NUMERALS ONLY)  ";A$
380 PRINT
390 PRINT CHR$(27);"p"
400 PRINT "PICK UP PHONE--WAIT FOR DIAL TONE AND HIT RETURN"
410 PRINT CHR$(27);"q"
420 PAUSE
430 PAUSE 500
440 L=LEN(A$)
450 FOR X=1TO L
455 Z1=VAL(MID$(A$,X,1))
456 IF Z1=0 THEN Z1=10
460 FOR Z=1 TO Z1
470 OUT 192,0
480 PAUSE 30
490 NEXT Z
500 PAUSE 375
510 NEXT X
520 PRINT "DIALING HAS BEEN COMPLETED....."
530 PRINT :PRINT
540 GOTO 360
550 END
```

Software driver routine (version 2.1).

circuit. It is designed for use on single-drive systems, but is currently configured for dual drives. Modification to single-drive systems only requires that all write-to-disk and read-from-disk program statements be changed by removing the device name "SY1:".

Because of the length of the program, it has been subdivided into six modules that chain each other under program control. This frees more RAM for record storage. To load and run DIRECTORY, load BASIC and type CHAIN "DIRECT". *Be sure when typing in the BASIC code to make the disk file name of the particular module the same as the name on line 10 of all the subprograms.*

You will be able to store 125 names and phone numbers in each file that you create. I suggest that you divide your files into alphabetic listings. For example, put all people whose last name begins with the letter A in one file, all with the letter B in another, and so on. Although this is in no way required by the program to properly operate, it probably will help speed access times when searching for a particular name. This would only be practical if you intend to store several hundred names in the directory.

The total number of files allowed is a function of the total available free space on whichever disk drive you are using to store the data.

The options are 1—CREATE, 2—ADD, 3—UPDATE, 4—SORT, 5—PRINT DIRECTORY, 6—SEARCH/MANUAL DIAL and 7—END.

Create

Use this option when first starting a new file. The maximum number of records allowed for any one file is 125. This is determined by the remaining available RAM after BASIC

and DIRECTORY have been loaded. First enter a legal eight-character name for the file you will create. The extension name ".DAT" will automatically be added to your entry. At this point you are ready to enter the first name. Type in your data in response to the prompts within the graphically drawn form that is displayed.

For the name entry, you are allowed ten characters for the first name (up to the vertical bar in the name field). When the first name has been entered, hit RETURN. The cursor will shift to the last name position. You are allowed 13 characters. If any entry is an illegal length, an error message will be displayed and the entry will be erased, thus allowing it to be reentered.

The address field is the next entry. A maximum of 28 characters is permitted. Normally no state or zip would be entered; only street addresses, and possibly the city if there is sufficient room

Next is the category field. This is a general-purpose ten-character entry that can be used to identify or group together two or more records for use of option B as described later. Any records that contain the same category name can be successively dialed after each other. For example, if you decide to enter the names and phone

Program listing: DIRECT.BAS.

```
00010 REM     ******** DIRECT.BAS ********
00020 REM         Written by Ray Massa
00030 REM              Version 1.0
00040 REM              Feb.02,1980
00050 REM     ******************************
00060 REM
00070 REM
00080 CLEAR
00090 DIM T$(125)
00100 GOSUB 1320
00110 PRINT TAB(30)"1......CREATE"
00120 PRINT TAB(30)"2......ADD"
00130 PRINT TAB(30)"3......UPDATE"
00140 PRINT TAB(30)"4......SORT"
00150 PRINT TAB(30)"5......PRINT DIRECTORY"
00160 PRINT TAB(30)"6......SEARCH/MANUAL DIAL"
00170 PRINT TAB(30)"7......END"
00180 PRINT :PRINT
00190 PRINT TAB(25);:LINE INPUT " Enter:  ";X$
00200 IF X$="1"THEN 300
00210 IF X$="2"THEN CHAIN "DIRCTADD"
00220 IF X$="3"THEN CHAIN "DIRCTUP"
00230 IF X$="4"THEN CHAIN "DSORT"
00240 IF X$="5"THEN CHAIN "DPRINT"
00250 IF X$="6"THEN CHAIN "DIAL"
00260 IF X$="7" THEN 1570
00270 GOTO 190
00280 :
00290 :
00300 REM     CREATE
00310 GOSUB 1520
00320 INPUT "Enter a Unique Name for this File: (max. 8 char.)  ";V$
00330 V$=LEFT$(V$,8)+".DAT"
00340 PRINT :PRINT
00350 PRINT "The Name of this File will be  ";V$;" "
00360 PRINT :PRINT TAB(10);
00370 INPUT "ARE YOU SURE? ";X$
00380 IF X$="N" OR X$="n"THEN 310
00390 IF X$="Y"OR X$="y" THEN 420
00400 GOTO 360
00410 :
00420 REM     DISPLAY CHART
00430 PRINT :PRINT :PRINT
00440 FOR F=1 TO 125
00450 GOSUB 1440
00460 PRINT CHR$(27);"E";
00470 PRINT CHR$(27);"F";
00480 PRINT CHR$(27);CHR$(120);CHR$(53);
00490 PRINT "faaaaaaaaaaasaaaaaaaaaaasaaaaaaaaaaaaaaaaaac"
00500 PRINT "` NAME:      `";TAB(45)"`"
00510 PRINT "`"TAB(13)"`";TAB(45)"`"
00520 PRINT "` ADDRESS:   `";TAB(45)"`"
00530 PRINT "`"TAB(13)"`";TAB(45)"`"
00540 PRINT "` CATEGORY   `";TAB(45)"`"
00550 PRINT "`"TAB(13)"`";TAB(45)"`"
00560 PRINT "` TELEPHONE `";TAB(45)"`"
00570 PRINT "eaaaaaaaaaaauaaaaaaaaaaaaaaaaaaaaaaaaaaaaad"
00580 PRINT CHR$(27);"G"
00590 PRINT CHR$(27);CHR$(121);CHR$(53);
00600 :
00610 :
00620 REM     INPUT RESPONSES
00630 L=-1
00640 C=14
00650 GOSUB 1280
00660 LINE INPUT "";N1$
00670 N1$=N1$+"?"
00680 IF LEN(N1$) >11 THEN GOSUB 1330:GOTO 650
00690 N1$=N1$+LEFT$("           ",11-LEN(N1$))
00700 C=27
00710 GOSUB 1300
```

More →

Listing continued.

```
00720 LINE INPUT "";N2$
00730 IF LEN(N2$)>13THEN GOSUB 1300:PRINT "                    ":GOSUB 1300:GOTO 720
00740 N2$=N2$+LEFT$("              ",13-LEN(N2$))
00750 N$=N1$+" "+N2$
00760 :
00770 C=14
00780 GOSUB 1280
00790 LINE INPUT "";A$
00800 IF LEN(A$) >28 THEN GOSUB 1330:GOTO 770
00810 A$=A$+LEFT$("                                ",29-LEN(A$))
00820 :
00830 GOSUB 1280
00840 LINE INPUT "";C$
00850 IF LEN(C$)>10 THEN GOSUB 1330:GOTO 830
00860 C$=C$+LEFT$("          ",10-LEN(C$))
00870 :
00880 :
00890 GOSUB 1280
00900 LINE INPUT "";F$
00910 IF LEN(F$) >18 THEN GOSUB 1330:GOTO 890
00920 F$=F$+LEFT$("                  ",18-LEN(F$))
00930 :
00940 T$(F)=N$+A$+C$+F$
00950 GOSUB 1280
00960 PRINT :PRINT
00970 LINE INPUT "   ADD/DISCARD/QUIT?   ";X$
00980 IF X$="A" OR X$="a" THEN NEXT F :GOTO 1030
00990 IF X$="D" OR X$="d" THEN 460
01000 IF X$<>"Q" AND X$<>"q" THEN 970
01010 GOSUB 1520
01020 GOSUB 1150:GOTO 80
01030 GOSUB 1520
01040 PRINT "    This File Now Contains 125 Names -- NO MORE ALLOWED."
01050 PRINT
01060 PRINT "             Start a New File to Enter More Records."
01070 F=F-1
01080 PAUSE 1300
01090 GOSUB 1150:GOTO 80
01100 :
01110 :
01120 :
01130 REM     SUBROUTINES
01140 REM
```

More

numbers of local computer stores in your area, then enter "COMPUTER" for the category entry in each of these records.

The telephone number is the last entry. You may type up to 18 characters for this field. For example, the following telephone numbers are all legal: 1-(313)-642-7990, TR-54321, (412)-922-4444.

Any ASCII character can be typed in and will be accepted. However, all punctuation, hyphens, parentheses, etc., will not become part of the phone number. Only numerals and alphabetical characters are valid. Alphabetical characters will be converted to their proper numerical value as determined by the notations on the phone dial. This will occur only when the program is actually dialing the number. Your original entry will always be preserved as typed in.

Add

This option performs exactly like the create mode. The only difference between the two is that records would already exist for a specific file

Listing continued.

```
01150 REM     WRITE ALL RECORDS TO DISK FILE
01160 PRINT CHR$(27);CHR$(121);CHR$(49)
01170 PRINT :PRINT
01180 PRINT V$;" Now Being Written to Disk File...."
01190 PAUSE 600
01200 OPEN "SY1:"+V$ FOR WRITE AS FILE #1
01210 PRINT #1,F
01220 FOR W=1TO F
01230 PRINT #1,T$(W)
01240 NEXT W
01250 CLOSE #1
01260 RETURN
01270 :
01280 REM     CURSOR ADDRESSING
01290 L=L+2
01300 PRINT CHR$(27);CHR$(89);CHR$(32+L);CHR$(32+C);
01310 RETURN
01320 :
01330 REM     ENTRY OVERFLOW
01340 GOSUB 1300
01350 PRINT CHR$(27);"K"
01360 GOSUB 1300
01370 PRINT "ILLEGAL LINE LENGTH! RE-ENTER '"
01380 GOSUB 1300
01390 PAUSE 500
01400 PRINT TAB(34)
01410 L=L-2
01420 RETURN
01430 :
01440 REM     25th LINE REFRESH
01450 PRINT CHR$(27);CHR$(106)
01460 PRINT CHR$(27);CHR$(120);CHR$(49);
01470 PRINT CHR$(27);CHR$(89);CHR$(56);CHR$(32);
01480 PRINT "ENTRY NUMBER ";F""
01490 PRINT CHR$(27);CHR$(107)
01500 RETURN
01510 :
01520 REM     CLEAR SCREEN
01530 PRINT CHR$(27);"E"
01540 PRINT :PRINT
01550 RETURN
01560 :
01570 END
```


↙See List of Advertisers on page 242

when calling up this option. You will be asked to enter the name of the file to be accessed. The program will read in that file and let you begin entering more data immediately after the last record on the old file. The 25th line of the terminal will display the number of records that exist on that file and will be incremented by one each time another record is added.

Update

If a specific field of any record needs to be altered, select this mode of the program. Simply type in the phone number of the record you wish to access. If that record is found, the current data for all fields will be displayed within the graphic lines drawn on the screen. An option list will then be displayed. Select which field you wish to change. The current data in that field will be erased and may then be reentered.

N—New Record F—Field Change
C—Cancel Q—Quit

Select N if you wish to keep the now updated record and then update another. Select F if you wish to change still another field for that same record. The cursor would then position itself to the field option list. You then enter the next field to be altered. Select C when you wish to abort the updating just made and start with the old data again. Select Q to save the updated record, exit the

Program listing: DIRCTADD.BAS.

```
00010 REM      ******* DIRCTADD.BAS *******
00020 REM        Function #2 of Direct.Bas
00030 REM          Written by Ray Massa
00040 REM              Version 1.0
00050 REM      ****************************
00060 REM
00070 CLEAR
00080 DIM T$(125)
00090 GOSUB 1360
00100 GOSUB 990
00110 IF F=125 GOTO 770
00120 :
00130 REM      DISPLAY CHART
00140 GOSUB 1360
00150 FOR F=W TO 125
00160 GOSUB 1280
00170 PRINT CHR$(27);"E";
00180 PRINT CHR$(27);"F";
00190 PRINT CHR$(27);CHR$(120);CHR$(53);
00200 PRINT "faaaaaaaaaasaaaaaaaaaasaaaaaaaaaaaaaaaaaac"
00210 PRINT "` NAME:      `";TAB(45)"`"
00220 PRINT "`"TAB(13)"`";TAB(45)"`"
00230 PRINT "` ADDRESS:   `";TAB(45)"`"
00240 PRINT "`"TAB(13)"`";TAB(45)"`"
00250 PRINT "` CATEGORY   `";TAB(45)"`"
00260 PRINT "`"TAB(13)"`";TAB(45)"`"
00270 PRINT "` TELEPHONE `";TAB(45)"`"
00280 PRINT "eaaaaaaaaaaauaaaaaaaaaaaaaaaaaaaaaaaaaaaaad"
00290 PRINT CHR$(27);"G"
00300 PRINT CHR$(27);CHR$(121);CHR$(53);
00310 :
00320 :
00330 REM      INPUT RESPONSES
00340 L=-1
00350 C=14
00360 GOSUB 1120
00370 LINE INPUT "";N1$
00380 N1$=N1$+"?"
00390 IF LEN(N1$) >11THEN GOSUB 1170:GOTO 360
00400 N1$=N1$+LEFT$("           ",11-LEN(N1$))
00410 C=27
00420 GOSUB 1140
00430 LINE INPUT "";N2$
00440 IF LEN(N2$) >13 THEN GOSUB 1140:PRINT "                  `":GOSUB 1140:GOTO 430
00450 N2$=N2$+LEFT$("             ",13-LEN(N2$))
00460 N$=N1$+" "+N2$
00470 :
00480 :
00490 C=14
00500 GOSUB 1120
00510 LINE INPUT "";A$
00520 IF LEN(A$) >28 THEN GOSUB 1170:GOTO 490
00530 A$=A$+LEFT$("                           ",28-LEN(A$))
00540 :
00550 GOSUB 1120
00560 LINE INPUT "";C$
00570 IF LEN(C$) >10 THEN GOSUB 1170:GOTO 550
00580 C$=C$+LEFT$("          ",10-LEN(C$))
00590 :
00600 GOSUB 1120
00610 LINE INPUT "";F$
00620 IF LEN(F$) > 18 THEN GOSUB 1170:GOTO 600
00630 F$=F$+LEFT$("                 ",18-LEN(F$))
00640 :
00650 T$(F)=N$+A$+C$+F$
00660 GOSUB 1120
00670 PRINT :PRINT
00680 LINE INPUT "   ADD/DISCARD/QUIT?   ";X$
00690 IF X$="A" OR X$="a" THEN NEXT F :GOTO 760
00700 IF X$="D" OR X$="d" THEN 170
00710 IF X$<>"Q" AND X$<>"q" THEN 680
00720 GOSUB 1360
00730 GOSUB 880
00740 CHAIN "DIRECT"
00750 :
00760 F=F-1
00770 GOSUB 1360
00780 PRINT "    This File Now Contains 125 Records -- NO MORE ALLOWED."
00790 PRINT
00800 PRINT "            Start a New File to Enter More Records."
00810 PAUSE 1300
00820 GOSUB 880
00830 CHAIN "DIRECT"
00840 :
00850 :
00860 REM      SUBROUTINES
00870 REM
00880 REM      WRITE ALL RECORDS TO DISK FILE
00890 PRINT CHR$(27);CHR$(121);CHR$(49)
00900 PRINT :PRINT TAB(25)"Now Being Written to Disk File...."
00910 OPEN "SY1:"+V$ FOR WRITE AS FILE #1
00920 PRINT #1,F
00930 FOR W=1TO F
00940 PRINT #1,T$(W)
00950 NEXT W
```

More →

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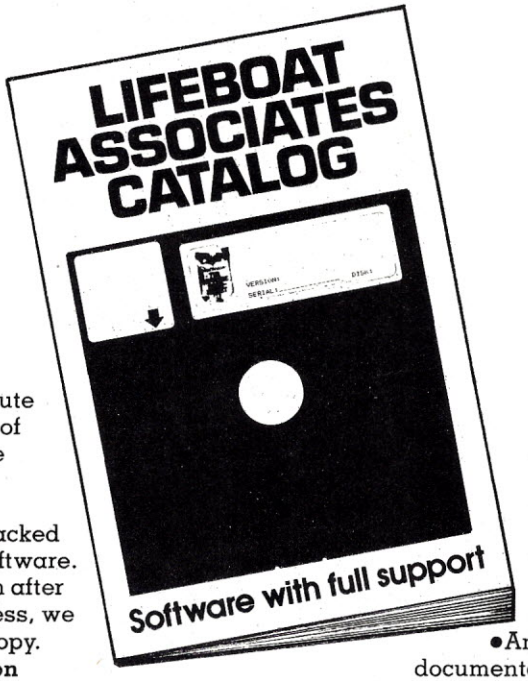

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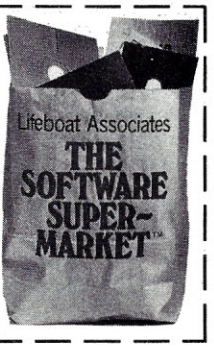

↙See List of Advertisers on page 242

UPDATE mode and return to the menu.

Sort

This option will simply sort any file that you have created, alphabetically by last name only. First enter in the name of the file you wish to sort. Sorting will then begin, and, when completed, the file will be displayed on the video terminal, and written back to the disk. You will then be returned to the menu.

Print Directory

This will give you a hard-copy output of your complete directory for the file that you specify. Listings will be printed in a double-column format. All fields and all records within a file will be printed. This version is configured for a line printer as the hard-copy device. Change line 240 in DPRINT.BAS if you are using something other than this.

Search Dial/Manual Dial

This area of the program is where the actual search and dialing of phone numbers is performed. When

Listing continued.

```
00960 CLOSE #1
00970 RETURN
00980 :
00990 REM     READ IN FILE
01000 INPUT "  Enter the Name of the File You Wish to Access:  ";V$
01010 PRINT :PRINT :PRINT
01020 V$=LEFT$(V$,8)+".DAT"
01030 OPEN "SY1:"+V$ FOR READ AS FILE #1
01040 INPUT #1,;F
01050 PRINT :PRINT :PRINT TAB(30)"Now Reading in Data....."
01060 FOR W=1TO F
01070 LINE INPUT #1,;T$(W)
01080 NEXT W
01090 CLOSE #1
01100 RETURN
01110 :
01120 REM     CURSOR ADDRESSING
01130 L=L+2
01140 PRINT CHR$(27);CHR$(89);CHR$(32+L);CHR$(32+C);
01150 RETURN
01160 :
01170 REM     ENTRY OVERFLOW
01180 GOSUB 1140
01190 PRINT CHR$(27);"K"
01200 GOSUB 1140
01210 PRINT "ILLEGAL LINE LENGTH! RE-ENTER `"
01220 GOSUB 1140
01230 PAUSE 500
01240 PRINT TAB(34)
01250 L=L-2
01260 RETURN
01270 :
01280 REM     25th LINE REFRESH
01290 PRINT CHR$(27);CHR$(106)
01300 PRINT CHR$(27);CHR$(120);CHR$(49);
01310 PRINT CHR$(27);CHR$(89);CHR$(56);CHR$(32);
01320 PRINT "ENTRY NUMBER ";F""
01330 PRINT CHR$(27);CHR$(107)
01340 RETURN
01350 :
01360 REM     CLEAR SCREEN
01370 PRINT CHR$(27);"E"
01380 PRINT :PRINT
01390 RETURN
01400 :
01410 END
```

Program listing: DIRCTUP.BAS.

```
00010 REM     ******* DIRCTUP.BAS ********
00020 REM      Function #3 of Direct.Bas
00030 REM         Written by Ray Massa
00040 REM              Version 1.0
00050 REM     ****************************
00060 REM
00070 CLEAR
00080 DIM T$(125)
00090 GOSUB 2020
00100 GOSUB 1890
00110 :
00120 GOSUB 2020
00130 PRINT "  Type 'QUIT' To Exit  "
00140 PRINT
00150 PRINT "Enter the PHONE NUMBER"
00160 LINE INPUT "of the Record You Want to Update: ";Q$
00170 IF Q$="QUIT"OR Q$="quit" THEN CHAIN "DIRECT"
00180 Q$=Q$+LEFT$("                    ",18-LEN(Q$))
00190 FOR W=1TO F
00200 IF Q$=MID$(T$(W),64,18) THEN 290
00210 NEXT W
00220 PRINT :PRINT :PRINT
00230 PRINT " ";Q$;"  Was Not Matched With Any Phone Numbers in this File."
00240 PRINT :PRINT "Check Your Entry For Proper Syntax."
00250 PRINT :PRINT "<CR>";:PAUSE
00260 GOTO 120
00270 :
00280 :
00290 REM     DISPLAY CURRENT RECORD FIELDS
00300 REM
00310 N$=LEFT$(T$(W),25)
00320 A$=MID$(T$(W),26,28)
00330 C$=MID$(T$(W),54,10)
00340 F$=MID$(T$(W),64,18)
00350 :
00360 GOSUB 2020
00370 PRINT :PRINT
00380 PRINT TAB(55)"1--Name"
00390 PRINT TAB(55)"2--Address"
00400 PRINT TAB(55)"3--Category"
00410 PRINT TAB(55)"4--Telephone #"
00420 :
00430 PRINT CHR$(27);"H";
00440 PRINT CHR$(27);"F";
00450 PRINT CHR$(27);CHR$(120);CHR$(53);
00460 PRINT "faaaaaaaaaasaaaaaaaaaasaaaaaaaaaaaaaaaaaac"
00470 PRINT "` NAME:      `";TAB(45)"`"
00480 PRINT "`"TAB(13)"`";TAB(45)"`"
```

More

Listing continued.

```
00490 PRINT "` ADDRESS:  `";TAB(45)"`"
00500 PRINT "`"TAB(13)"`";TAB(45)"`"
00510 PRINT "` CATEGORY  `";TAB(45)"`"
00520 PRINT "`"TAB(13)"`";TAB(45)"`"
00530 PRINT "` TELEPHONE `";TAB(45)"`"
00540 PRINT "eaaaaaaaaaauaaaaaaaaaaaaaaaaaaaaaaaaaaaaad"
00550 PRINT CHR$(27);"G"
00560 PRINT CHR$(27);CHR$(121);CHR$(53);
00570 GOTO 610
00580 :
00590 :
00600 :
00610 T5=0
00620 X$=""
00630 REM     INPUT RESPONSES
00640 L=-1 :C=14
00650 GOSUB 1720
00660 IF X$="1"THEN 720
00670 IF T5=99 THEN 860
00680 L3=MATCH(N$,"?",1)
00690 PRINT LEFT$(N$,L3-1);TAB(21);RIGHT$(N$,13)
00700 GOTO 860
00710 REM
00720 GOSUB 1670
00730 LINE INPUT "";N1$
00740 N1$=N1$+"?"
00750 IF LEN(N1$) >11 THEN GOSUB 1770:GOTO 650
00760 N1$=N1$+LEFT$("           ",11-LEN(N1$))
00770 C=27
00780 GOSUB 1740
00790 LINE INPUT "";N2$
00800 IF LEN(N2$) >13 THEN GOSUB 1740:PRINT "                F`G":GOSUB 1740:GOTO 790
00810 N2$=N2$+LEFT$("             ",13-LEN(N2$))
00820 N$=N1$+" "+N2$
00830 GOTO 1330
00840 :
00850 C=14
00860 GOSUB 1720
00870 IF X$="2"THEN 920
00880 IF T5=99THEN 980
00890 PRINT A$
00900 GOTO 980
00910 REM
00920 GOSUB 1670
00930 LINE INPUT "";A$
00940 IF LEN(A$) >28 THEN GOSUB 1770:GOTO 860
00950 A$=A$+LEFT$("                          ",28-LEN(A$))
00960 GOTO 1330
00970 :
00980 GOSUB 1720
00990 IF X$="3"THEN 1040
01000 IF T5=99THEN 1100
01010 PRINT C$
01020 GOTO 1100
01030 REM
01040 GOSUB 1670
01050 LINE INPUT "";C$
01060 IF LEN(C$) >10 THEN GOSUB 1770:GOTO 980
01070 C$=C$+LEFT$("          ",10-LEN(C$))
01080 GOTO 1330
01090 :
01100 GOSUB 1720
01110 IF X$="4"THEN 1160
01120 IF T5=99THEN 1230
01130 PRINT F$
01140 GOTO 1230
01150 REM
01160 GOSUB 1670
01170 LINE INPUT "";F$
01180 IF LEN(F$) >18 THEN GOSUB 1770:GOTO 1100
01190 F$=F$+LEFT$("                  ",18-LEN(F$))
01200 GOTO 1330
01210 :
01220 :
01230 L=13
01240 C=51
01250 GOSUB 1720
01260 PRINT CHR$(27);"K":GOSUB 1740
01270 LINE INPUT " What Field Changes?  ";X$
01280 IF VAL(X$)<1 OR VAL(X$)>4 THEN 1230
01290 T5=99
01300 GOTO 630
01310 :
01320 :
01330 L=11
01340 GOSUB 1720
01350 PRINT CHR$(27);"J";
01360 PRINT
01370 PRINT TAB(10)"N -- New Record"
01380 PRINT TAB(10)"F -- Field Change"
01390 PRINT TAB(10)"C -- Cancel"
01400 PRINT TAB(10)"G -- Quit"
01410 PRINT
01420 PRINT TAB(7);
01430 LINE INPUT " ENTER:  ";X$
01440 IF X$="N"OR X$="n"THEN T$(W)=N$+A$+C$+F$:GOTO 110
01450 IF X$="F"OR X$="f"THEN 1230
01460 IF X$="C"OR X$="c"THEN 290
01470 IF X$<>"G"AND X$<>"g" THEN 1330
01480 T$(W)=N$+A$+C$+F$
01490 GOSUB 2020
01500 GOSUB 1540
01510 CHAIN "DIRECT"
01520 :
```

More →

Listing continued.

```
01530 :
01540 REM     WRITE ALL RECORDS TO DISK FILE
01550 PRINT CHR$(27);CHR$(121);CHR$(49)
01560 PRINT :PRINT
01570 PRINT "   ";V$;" Now Beins Written to Disk File...."
01580 PAUSE 600
01590 OPEN "SY1:"+V$ FOR WRITE AS FILE #1
01600 PRINT #1,F
01610 FOR W=1TO F
01620 PRINT #1,T$(W)
01630 NEXT W
01640 CLOSE #1
01650 RETURN
01660 :
01670 REM     ERASE OLD LINE
01680 PRINT SPC(29)
01690 GOSUB 1740
01700 RETURN
01710 :
01720 REM     CURSOR ADDRESSING
01730 L=L+2
01740 PRINT CHR$(27);CHR$(89);CHR$(32+L);CHR$(32+C);
01750 RETURN
01760 :
01770 REM     ENTRY OVERFLOW
01780 GOSUB 1740
01790 PRINT TAB(45)
01800 GOSUB 1740
01810 PRINT CHR$(7);
01820 PRINT "ILLEGAL LINE LENGTH! Re-Enter '"
01830 GOSUB 1740
01840 PAUSE 500
01850 PRINT TAB(34)
01860 L=L-2
01870 RETURN
01880 :
01890 REM     READ IN FILE
01900 INPUT "  Enter the Name of the File You Wish to UPDATE:  ";V$
01910 V$=LEFT$(V$,8)+".DAT"
01920 OPEN "SY1:"+V$ FOR READ AS FILE #1
01930 INPUT #1,;F
01940 PRINT :PRINT :PRINT
01950 PRINT TAB(30)"File Now Beins Read...."
01960 FOR W=1TO F
01970 LINE INPUT #1,;T$(W)
01980 NEXT W
01990 CLOSE #1
02000 RETURN
02010 :
02020 REM     CLEAR SCREEN
02030 PRINT CHR$(27);"E"
02040 PRINT :PRINT :PRINT :
02050 RETURN
02060 :
02070 END
```

Program listing: DSORT.

```
00010 REM     ********** DSORT **********
00020 REM      Function #4 of Direct.Bas
00030 REM         Written by Ray Massa
00040 REM             Version 1.0
00050 REM     ****************************
00060 REM
00070 REM
00080 CLEAR
00090 DIM T$(125),L$(125)
00100 GOSUB 1330
00110 INPUT "Enter the Name of the File to be SORTED: ";V$
00120 V$=LEFT$(V$,8)+".DAT"
00130 PRINT :PRINT :PRINT
00140 PRINT "  FILE TO BE SORTED IS  ";V$;" "
00150 PRINT :INPUT "     Sure? ";X$
00160 IF X$="Y" OR X$="y" THEN 180
00170 GOTO 100
00180 GOSUB 1330
00190 :
00200 :
00210 REM     SORT/MERGE ROUTINE
00220 REM
00230 REM     READ INTO TEMP. ARRAY
00240 OPEN "SY1:"+V$ FOR READ AS FILE #1
00250 INPUT #1,;F
00260 GOSUB 1330
00270 PRINT TAB(30)"Data Now Beins Read."
00280 FOR W=1TO F
00290 LINE INPUT #1,;L$(W)
00300 NEXT W
00310 CLOSE #1
00320 GOSUB 1330
00330 :
00340 :
00350 PRINT TAB(25)"SORTING NOW IN PROGRESS...."
00360 PRINT :PRINT
00370 PRINT TAB(28)"Please Be Patient."
```

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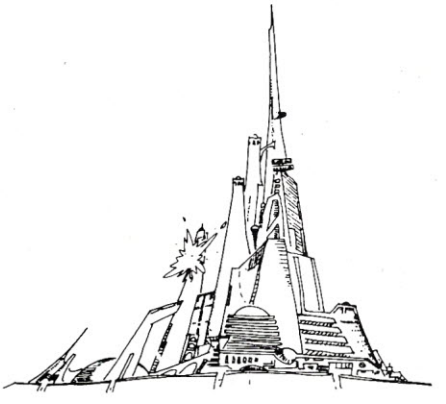

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Listing continued.

```
00380 PRINT
00390 PRINT TAB(19)"Will Require ";"";INT(LOG(F)/LOG(2))+1;"";" Steps to Complete."
00400 PRINT :PRINT TAB(10)"STEP # 1"
00410 :
00420 :
00430 REM
00440 REM     PASSES
00450 REM
00460 GOSUB 650
00470 S3=INT(LOG(F)/LOG(2))
00480 L2=1
00490 REM
00500 FOR W=1TO S3
00510 PRINT :PRINT TAB(10)"STEP #";W+1
00520 L2=2*L2
00530 S1=1
00540 S2=S1+L2
00550 GOSUB 790
00560 S1=S2+L2
00570 IF S1 <= F THEN 540
00580 GOSUB 1060
00590 NEXT W
00600 GOSUB 1150
00610 CLEAR
00620 CHAIN "DIRECT"
00630 :
00640 :
00650 REM     EXCHANGE PAIRS
00660 REM
00670 FOR J=1TO F STEP 2
00680 IF J=F THEN 750
00690 IF MID$(L$(J),13,13) < MID$(L$(J+1),13,13) THEN 750
00700 REM
00710 REM
00720 T8$=L$(J)
00730 L$(J)=L$(J+1)
00740 L$(J+1)=T8$
00750 NEXT J
00760 RETURN
00770 :
00780 :
00790 REM     MERGE
00800 I1=S1
00810 I2=S2
00820 M=S2+L2-1
00830 IF M<=F THEN 860
00840 M=F
00850 REM
00860 FOR K=S1 TO M
00870 IF I1>=S2 THEN 920
00880 IF I2>=(M+1)THEN 980
00890 IF MID$(L$(I1),13,13) <= MID$(L$(I2),13,13) THEN 980
00900 REM
00910 REM     SMALL
00920 T$(K)=L$(I2)
00930 L$(I2)=""
00940 I2=I2+1
00950 GOTO 1010
00960 REM
00970 REM     LARGE
00980 T$(K)=L$(I1)
00990 L$(I1)=""
01000 I1=I1+1
01010 REM
01020 NEXT K
01030 RETURN
01040 :
01050 :
01060 REM     COPY TEMP. TO PERM.
01070 REM
01080 FOR K=1 TO F
01090 L$(K)=T$(K)
01100 T$(K)=""
01110 NEXT K
01120 RETURN
01130 :
01140 :
01150 REM     WRITE TO DISK
01160 PRINT CHR$(27);"E"
01170 PRINT :PRINT :PRINT
01180 PRINT TAB(30)"SORTING COMPLETED."
01190 REM
01200 PRINT
01210 PRINT TAB(20)"Sorted File Now Beins Written to Disk."
01220 PRINT :PRINT
01230 OPEN "SY1:"+V$ FOR WRITE AS FILE #1
01240 PRINT #1,F
01250 FOR W=1TO F
01260 PRINT W;" ";L$(W)
01270 PRINT :PRINT
01280 PRINT #1,L$(W)
01290 NEXT
01300 CLOSE #1
01310 RETURN
01320 :
01330 REM     CLEAR SCREEN
01340 PRINT CHR$(27);"E"
01350 PRINT :PRINT :PRINT
01360 RETURN
01370 :
01380 END
```

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selected, the following option list will be presented:

- A. . . . . SEARCH & DIAL
- B. . . . . DIAL COMMON CATEGORY
- C. . . . . MANUAL DIALING
- D. . . . . READ IN FILE
- E. . . . . EXIT

First select option D. This will ask the name of the file to read in. After this is done, you will again be presented the option list. Select option D whenever you want to access another file of the directory.

Search and Dial

Enter the last name of the person or place that you want to call. You may also enter the first name at the corresponding prompt, if needed. This would only be needed if there are more than two records on the same file with the same last name. If you do not need to enter a first name, then type a carriage return in response to the prompt. The program will then search for the desired record. When it is found, you will be notified to pick up the phone and stand by. A message will then instruct you to hit return to dial the phone number. When this is done, the terminal will display the name of the person or place that is being dialed, along with each digit of the number being displayed as it is being pulsed over the phone line.

You then either proceed with your conversation when the phone is answered, or, if the line is busy, you have the option of redialing. This does not involve searching again for the same record, so redialing takes place immediately after hitting return in response to the prompt. Note that you must first hang up the phone to reset the telephone line before proceeding to redial.


```
00010 REM    ********* DPRINT **********
00020 REM     Function #5 of Direct.Bas
00030 REM        Written by Ray Massa
00040 REM             Version 1.0
00050 REM    ****************************
00060 REM
00070 REM
00080 CLEAR
00090 DIM T$(125),N$(2),A$(2),C$(2),F$(2)
00100 GOSUB 730
00110 INPUT "Enter the Name of the File You Wish to Print: ";V$
00120 V$=LEFT$(V$,8)+".DAT"
00130 :
00140 :
00150 GOSUB 730
00160 PRINT "  ALIGN PAPER; "
00170 PRINT
00180 PRINT "Hit 'RETURN' for Printer Output;"
00190 PRINT
00200 PRINT "Enter 'V' for Video Output."
00210 LINE INPUT "";G5$
00220 IF G5$="V" OR G5$="v"THEN OPEN "TT:"FOR WRITE AS FILE #1:GOTO 250
00230 :
00240 OPEN "LP:" FOR WRITE AS FILE #1
00250 OPEN "SY1:"+V$ FOR READ AS FILE #2
00260 INPUT #2,;F
00270 F5=F  :M5=2
00280 IF F/2 <> INT(F/2) THEN F5=F+1 :G5=1
00290 FOR Y=1 TO F5/2
00300 REM
00310 REM      INPUT 1 OR 2 RECORDS
00320 IF G5=1 AND Y=F5/2 THEN M5=1
00330 FOR W=1 TO M5
00340 LINE INPUT #2,;T$
00350 N$(W)=LEFT$(T$,25)
00360 A$(W)=MID$(T$,26,28)
00370 C$(W)=MID$(T$,54,10)
00380 F$(W)=RIGHT$(T$,18)
00390 NEXT W
00400 :
00410 :
00420 REM      T,P = TAB POSITION
00430 T=2 :P=45
00440 L3=MATCH(N$(1),"?",1)
00450 L4=MATCH(N$(2),"?",1)
00460 REM
00470 PRINT #1,TAB(T);LEFT$(N$(1),L3-1);MID$(N$(1),LEN(N$(1))-13,13);
00480 IF G5=1 AND Y=F5/2THEN PRINT #1,:GOTO 500
00490 PRINT #1,TAB(P);LEFT$(N$(2),L4-1);MID$(N$(2),LEN(N$(2))-13,13)
00500 REM
00510 PRINT #1,TAB(T);A$(1);
00520 IF G5=1AND Y=F5/2THEN PRINT #1,:GOTO 540
00530 PRINT #1,TAB(P);A$(2)
00540 REM
00550 PRINT #1,TAB(T);C$(1);
00560 IF G5=1 AND Y=F5/2THEN PRINT #1,:GOTO 580
00570 PRINT #1,TAB(P);C$(2)
00580 REM
00590 PRINT #1,TAB(T);F$(1);
00600 IF G5=1AND Y=F5/2 THEN PRINT #1,:GOTO 620
00610 PRINT #1,TAB(P);F$(2)
00620 PRINT #1,:PRINT #1,:PRINT #1,
00630 NEXT Y
00640 CLOSE #1
00650 CLOSE #2
00660 :
00670 :
00680 PRINT :PRINT :PRINT
00690 PRINT TAB(25)"    END OF DATA    "
00700 PAUSE 1200
00710 CHAIN "DIRECT"
00720 :
00730 REM      CLEAR SCREEN
00740 PRINT CHR$(27);"E"
00750 PRINT :PRINT :PRINT
00760 RETURN
00770 :
00780 REM      ERROR MESSAGE
00790 PRINT :PRINT "ENTRY IS INVALID LENGTH!"
00800 RETURN
00810 :
00820 END
```

Program listing. DPRINT.

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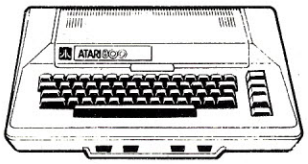

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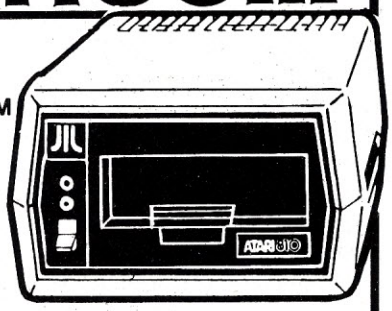

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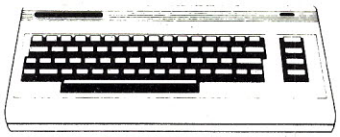

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Dial Common Category

This mode operates quite similarly to the search and dial option. The main difference is that instead of entering in a person's name to search for a phone number, you input a specific category that may be common to one or more records. This is a very handy feature if, for instance, you want to call several places of business that are of common interest. For example, you may desire to place several calls to electronic outlet stores to locate a particular integrated circuit.

All electronic stores in your directory should have a common category name, such as ELECTRONIC. Maximum length of this field is ten characters. After one phone number has been dialed out, you are asked if it should continue to search for more records with the same category. If answered yes or a carriage return, it will search until either another record is found or until the end of the data for that file is reached.

Manual Dialing

This option will turn your computer keyboard into the phone dialer. Just type in the phone number you want to dial out. You may enter any punctuation characters you want. The program will convert your entry into the proper numerical number. The program will prompt you to pick up the receiver and stand by. You may then activate dialing when the next prompt appears by hitting return. Exit this mode by depressing the red function key and hitting return.

Read in File

You may read in any other file that was previously created using this mode. Enter in the new name of the file, which will be read in if it is found. You must be certain to only specify a file that exists on your disk; otherwise, you will get an HDOS error message. This simply returns you to the main menu, where you may either end the program or enter another mode of the program.

End

This is option number 7 of the main menu. It simply exits the program and returns to the BASIC interpreter command mode.

Conclusion

Tele-Pulse can be a very useful addition to your computer system when used with either your own software or with the directory program. Remark statements have been used extensively throughout the program to make it easier for you to modify the program if you so desire. Since the BASIC code is rather lengthy, be careful of typing errors. If you prefer not to make your own printed circuit board, an etched and drilled one is available from me for $7.50 postpaid.■

Program listing: DIAL.BAS.

```
00010 REM     ********** DIAL.BAS **********
00020 REM        Function #6 of Direct.Bas
00030 REM          Written by Ray Massa
00040 REM               Version 1.0
00050 REM     ******************************
00060 REM
00070 REM
00080 REM

00090 CLEAR
00100 DIM T$(125)
00110 OPEN "H5:" FOR WRITE AS FILE #1
00120 CLOSE #1
00130 GOSUB 1840
00140 N1$="":N2$=""
00150 PRINT TAB(30)"A.....Search & Dial"
00160 PRINT TAB(30)"B.....Dial Common Catesory"
00170 PRINT TAB(30)"C.....Manual Dialins"
00180 PRINT TAB(30)"D.....Read in File"
00190 PRINT TAB(30)"E.....Exit"
00200 PRINT :PRINT
00210 PRINT TAB(30);:LINE INPUT " Enter:  ";X$
00220 IF X$="A"THEN GOSUB 290:GOTO 130
00230 IF X$="B"THEN GOSUB 540:GOTO 130
00240 IF X$="C"THEN GOSUB 770:GOTO 130
00250 IF X$="D"THEN GOSUB 970:GOTO 130
00260 IF X$="E"THEN CHAIN "DIRECT"
00270 GOTO 130
00280 :

00290 REM     SEARCH/DIAL
00300 GOSUB 1840
00310 PRINT "Enter the Name or Place to be Called."
00320 PRINT
00330 LINE INPUT "                              LAST NAME:  ";N2$
00340 LINE INPUT "                             FIRST NAME:  ";N1$
00350 N2$=N2$+LEFT$("             ",13-LEN(N2$))
00360 N1$=N1$+"? "+LEFT$("           ",10-LEN(N1$))
00370 FOR W=1TO F
00380 IF N1$="?           "THEN 410
00390 IF N1$+N2$<>LEFT$(T$(W),25)THEN NEXT W:GOSUB 1720:GOTO 130
00400 GOTO 420
00410 IF N2$<>MID$(T$(W),13,13) THEN NEXT W:GOSUB 1720:GOTO 130
00420 X$=RIGHT$(T$(W),18)
00430 PRINT :PRINT :PRINT CHR$(7)
00440 PRINT "   FOUND --> ";N2$;"    *** Pick Up Phone and Stand-by ***"
00450 GOSUB 1120
00460 GOSUB 1380
00470 GOSUB 1630
00480 GOTO 130
00490 :
00500 :
00510 :

00520 REM     SUBROUTINES
00530 REM
00540 REM     COMMON CATEGORY
00550 GOSUB 1840
00560 K$=""
00570 LINE INPUT "Enter The Name of the Catesory: ";K$
00580 K$=K$+LEFT$("           ",10-LEN(K$))
00590 FOR W=1TO F
00600 IF K$<>MID$(T$(W),54,10) THEN NEXT W: GOSUB 1720:GOTO 130
00610 X$=RIGHT$(T$(W),18)
00620 PRINT :PRINT :PRINT CHR$(7)
00630 PRINT "  FOUND --> ";K$;"   *** Pick Up Phone and Stand-by ***"
00640 N1$=LEFT$(T$(W),12)
00650 N2$=MID$(T$(W),13,13)
00660 GOSUB 1120
00670 GOSUB 1380
00680 GOSUB 1630
00690 GOSUB 1840
00700 PRINT :PRINT :PRINT
00710 PRINT "DIAL NEXT NUMBER IN ";"   ";K$;" CATEGORY? ";:LINE INPUT "";X$
00720 IF X$="Y" OR X$="y" OR X$=""THEN NEXT W:GOSUB 1720:GOTO 130
00730 IF X$<>"N"AND X$<>"n"THEN 700
00740 GOTO 130
00750 :
00760 :
00770 REM     MANUAL DIAL
00780 GOSUB 1840
00790 PRINT "Your Keyboard is Now Active as the Telephone Dialer"
00800 PRINT
00810 PRINT "Simply Type in the Telephone Number and Hit RETURN."
00820 P$=""
00830 PRINT :PRINT :PRINT
00840 PRINT "HIT  RED FUNCTION KEY  TO QUIT THIS MODE."
00850 PRINT :PRINT :PRINT
00860 LINE INPUT "Phone #? ";X$
00870 IF X$=CHR$(27)+"G"THEN RETURN
00880 PRINT :PRINT :PRINT
00890 PRINT "    *** Pick Up Phone and Stand-by ***"
```

More →

Listing continued.

```
00900 GOSUB 1120
00910 GOSUB 1380
00920 GOSUB 1630
00930 GOSUB 1840
00940 GOTO 820
00950 :
00960 :
00970 REM     READ IN FILE
00980 GOSUB 1840
00990 INPUT "Enter the Name of the File You Wish to Access:  ";V$
01000 PRINT :PRINT :PRINT
01010 V$=LEFT$(V$,8)+".DAT"
01020 OPEN "SY1:"+V$ FOR READ AS FILE #1
01030 INPUT #1,;F
01040 PRINT :PRINT :PRINT TAB(30)"Now Reading in Data...."
01050 FOR W=1TO F
01060 LINE INPUT #1,;T$(W)
01070 NEXT W
01080 CLOSE #1
01090 RETURN
01100 :
01110 :
01120 REM     REPLACE NON-NUMERIC ENTRIES
01130 P$=""
01140 L=LEN(X$)
01150 FOR X=1TO L
01160 Z=ASC(MID$(X$,X,1))
01170 IF (Z>64 AND Z<91) OR (Z>96 AND Z<123) THEN GOSUB 1240
01180 IF Z>47 AND Z<58 THEN P$=P$+MID$(X$,X,1)
01190 REM     P$ = CORRECT #
01200 NEXT X
01210 RETURN
01220 :
01230 :
01240 REM     LOOK-UP VALUES
01250 X2$=""
01260 IF (Z>64 AND Z<68) OR (Z>96 AND Z<100) THEN X2$="2"
01270 IF (Z>67 AND Z<71) OR (Z>99 AND Z<103) THEN X2$="3"
01280 IF (Z>70 AND Z<74) OR (Z>102 AND Z<106) THEN X2$="4"
01290 IF (Z>73 AND Z<77) OR (Z>105 AND Z<109) THEN X2$="5"
01300 IF (Z>76 AND Z<80) OR (Z>108 AND Z<112) THEN X2$="6"
01310 IF (Z>79 AND Z<84) OR (Z>111 AND Z<116) THEN X2$="7"
01320 IF (Z>83 AND Z<87) OR (Z>115 AND Z<119) THEN X2$="8"
01330 IF (Z>86 AND Z<90) OR (Z>118 AND Z<122) THEN X2$="9"
01340 P$=P$+X2$
01350 RETURN
01360 :
01370 :
01380 REM     DIAL NUMBER
01390 GOSUB 1840
01400 PRINT CHR$(7);CHR$(27);"e";
01410 PRINT "  Hit RETURN to dial:  ";
01420 PRINT CHR$(27);"q"
01430 PAUSE
01440 PRINT :PRINT :PRINT TAB(10)"Name";TAB(55)"Number Beins Dialed"
01450 PRINT TAB(9)"----------";TAB(54)"----------"
01460 L4=MATCH(N1$,"?",1)
01470 IF L4=0THEN L4=1
01480 PRINT TAB(10);LEFT$(N1$,L4-1);" ";N2$;TAB(55);
01490 FOR X=1 TO LEN(P$)
01500 PRINT MID$(P$,X,1);
01510 G4=VAL(MID$(P$,X,1))
01520 IF G4=0THEN G4=10
01530 FOR Y=1TO G4
01540 OUT 254,0
01550 PAUSE 30
01560 NEXT Y
01570 PAUSE 375
01580 NEXT X
01590 PRINT
01600 RETURN
01610 :
01620 :
01630 REM     RE-DIAL
01640 PRINT :PRINT
01650 PRINT CHR$(7)
01660 LINE INPUT "  Re-Dial?   ";X$
01670 IF X$="Y" OR X$="y" OR X$="" THEN GOSUB 1380
01680 IF X$<>"N"AND X$<>"n"THEN 1640
01690 RETURN
01700 :
01710 :
01720 REM     EOF NOTICE
01730 GOSUB 1840
01740 PRINT :PRINT :PRINT
01750 PRINT CHR$(27);"F"
01760 PRINT TAB(25)"faaaaaaaaaaaaaaaaaac"
01770 PRINT TAB(25)"`    OUT OF DATA    `"
01780 PRINT TAB(25)"eaaaaaaaaaaaaaaaaaad"
01790 PRINT CHR$(27);"G"
01800 PRINT :PRINT TAB(25)"   Name Not Found"
01810 PRINT :PRINT "<CR>":PAUSE
01820 RETURN
01830 :
01840 REM     CLEAR SCREEN
01850 PRINT CHR$(27);"E"
01860 PRINT :PRINT :PRINT
01870 PAUSE 150
01880 RETURN
01890 :
01900 END
```


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Here's a computer course that lets you learn about microprocessors in the comfort of your own home.

Become a Troubleshooter—In 34 Easy Lessons

By J.C. Hassall

With the proliferation of microcomputers comes a demand for qualified service personnel. Anyone who has had to wait for a month or so while their machine was returned to the factory will agree. Because of the complexity of present-day systems and diversity of system components used, it would be economically infeasible to stock a large inventory of replacement parts and simply replace parts until the faulty component is found. Thus, the emphasis must be on troubleshooting rather than parts replacing.

To properly troubleshoot a system, you must know how the system operates. There are two ways to do this. One is to design and build a system from scratch. The experience gained in debugging a system is invaluable but expensive in terms of time and frustration. And obviously, if you have the technical expertise to design a working system, little will be gained by building one.

If, however, the system to be built is an existing design, then experience and knowledge can be derived from constructing the system. However, to whom do you turn for help when a bug develops?

The other way is to take a course. Adult education classroom courses are few and far between. Some colleges and universities offer courses, but these may not be available to the nonmatriculated student.

Then there are some home study courses, which enable the student to learn the material without the frustration and time investment required by the other method. Two such courses are available from National Technical Schools (4000 S. Figueroa St., Los Angeles, CA 90037, 213-234-9061). They're for the would-be serviceman, or for someone who wants to learn about microcomputers from the chip level out.

The courses vary in complexity. Course 1, Master Course in Microcomputers, covers transistor-transistor-logic (TTL) digital circuits, microprocessors of various types and programming using BASIC, and culminates with the completion of a Heath H-89 microcomputer. Course 2 does not go into as much chip level detail as does Course 1. The computer for Course 2 is the Rockwell AIM 65.

Course 1 is actually two courses: 1B and 1D. 1B assumes no prior knowledge of electronics. The student is trained in basic analog and digital electronics while building various kits directly related to the subject matter. The kits include a logic probe, a digital multimeter, a logic trainer and the Heath H-89.

Course 1D, Master Course in Microcomputers (with advanced standing), will be reviewed here. The course assumes a prior knowledge of TTL digital circuits. It eliminates all experiments covered in Course 1B. Presumably the computer kits provide the student with hands-on application of the text materials. With this course, such was not the case. There was simply no correlation whatsoever between the text material and the kits.

Two Components

The home study course consists of two components: text material and exams subdivided into 34 lessons plus a final exam, and 11 kits which compose the Heath H-89. All the materials provided with the course are illustrated in the photo.

The lesson study sequence is divided into three phases, and each phase is further divided into packages (each package includes lesson materials and/or exams mailed from NTS). The first phase introduces the student to digital computers in general. The classic hardware/software trade-off is a recurring theme throughout the course. The student is given an overview of how to evaluate a microprocessor, how to analyze simple software problems and how components

Address correspondence to J.C. Hassall, H&H Enterprises, PO Drawer H, Blacksburg, VA 24060.

fit together to form a microcomputer system.

The last package in the first phase takes the student on a quantum leap from very basic introductory material to Z-80 operations. The Z-80 is used as the basis for most design examples, while the 8080 is used for the balance. Z-80 interface signals and timing diagrams are discussed generally, while the instruction set is covered in somewhat greater detail. Upon completion of the first study phase, the diligent student will have learned a great deal about systems in general and the intricacies of the Z-80 in particular.

The lessons on Z-80 interfacing I felt were particularly good. While not a cookbook on interfacing, all information necessary to interface a variety of peripheral chips to the Z-80 is provided. The software lessons were equally good. The book provides the student with excellent exposure to Z-80 assembly-language software. Students experienced in assembly-language programming may want to simply skim the material, because no knowledge of assembly-language proficiency is assumed and the material is very basic. By the end of the first phase, the student should have completed the first three computer kits, consisting of the terminal base and power supply.

The second study sequence phase teaches the student about elementary programming techniques in Z-80 assembly language, with emphasis on programming techniques. Interfacing the CPU to peripherals, both in terms of software as well as hardware, is also covered. The Intel 8251 universal synchronous/asynchronous receiver/transmitter (USART) is the chip used to interface the 8080 CPU to the outside world. A reprint of the Intel data sheet provides the student with some exposure to an actual data sheet.

A series of eight lessons on automatic control technology round out the second study phase. According to the syllabus, the subjects covered are principles of automatic control technology, control sensing devices, digital and analog control circuits and systems, data acquisition and carrier current and telemetry. There was almost nothing whatsoever in these eight lessons applicable to the course of study. I simply could not reconcile the object of the course with block diagrams of pneumatic controllers, cement batching plants and the like.

This is not to say that the information was not interesting—it most certainly was. I feel, however, that a person taking the course on his or her own time at home to learn microcomputer troubleshooting would consider the lessons a total waste of time, and might even be bitter at the time spent.

By the end of the second phase, the student should have completed four more kits: three on the video circuit board and the front panel, cathode ray tube (CRT) and keyboard kit.

The third and final study sequence phase covers the *TV Typewriter Cookbook* entirely. The course gets back on track with the vocational objectives of the course by studying TV terminals and keyboard interfacing. Generally the computer itself is not considered, but rather the design characteristics involved with these two components of a computer system.

The second half of the third phase is devoted exclusively to programming in BASIC. The lesson material is Heath's *BASIC Programming*—their continuing education kit EC-1100. The material is organized around a particular programming example—a game of Blackjack.

The first few lessons introduce the student to BASIC through a tutorial text. Upon completion of the text, the student is walked through the Blackjack program, module-by-module. Fortunately, flowcharts are used extensively. This reinforces the knowledge of flowcharting gained in the first study phase and also gives clarity to the descriptions of the various program modules. A simulation of a game of Blackjack would be an overwhelming task for an experienced programmer, much less a student, were it not for modular programming. The game is broken into modules and each lesson consists of writing and debugging that module. After all the modules function properly, they are spliced together and the student has a functioning game of Blackjack.

The tutorial text, completed before the Blackjack simulation is begun, provides the student with a good foundation for learning more advanced programming, but I feel that the Blackjack program was too abstruse. The student could very easily become so bogged down in trying to follow the rules of the card game (the flowcharts notwithstanding) that the programming techniques to be learned could very easily be missed.

The simulation does give the student an appreciation of the complexity of defining a problem to be solved and then writing the program. But a number of easier examples, rather than one complex example, would serve the overall learning purpose better.

The Exams

The exams, generally one per lesson, are extracted directly from the text material. In almost every case,

Everything in the picture, with the exception of my daughter and her Peter Rabbit *book, comes with the course. The three notebooks leaning against the computer are the HDOS and the cassette operating system manuals and the* BASIC Programming *text. The remaining notebook contains lessons from NTS. The paper booklets on top of the NTS notebook are the automatic control technology lessons.*

the questions are taken verbatim from the text. An enterprising student could simply scan the lessons for an exact word match, score 100 percent for the course and not learn one bit. Pedagogically, the exams are very poorly designed in that they test only the student's ability to hunt for the correct answer, not the student's mastery of the subject.

By the end of the last phase, the student should have received the last five kits (final assembly and tests, the CPU logic/cassette boards, cassette software, the floppy disk interface and the disk operating system) and have an operational H-89 computer with 16K (16 thousand bytes) of memory, a 5-1/4 inch floppy disk and version 2.0 of the Heath Disk Operating System (HDOS).

Therein lies the largest problem with the course: the relationship between the lesson material and the kits. Until the last half of the last study phase, the kits and the lessons have nothing in common. While studying about CPU timing requirements, the student is assembling the power supply. While studying about automatic control technology, the student is assembling the keyboard. If the kits have been released on time, that is. The disparity between subject material and kit content aside, the kit release schedule is tied to the student's lesson progression and tuition paid.

Realistically, some type of control is necessary to ensure that studies and kits progress at the same rate. The problem is fundamentally one of timing and feedback between NTS and Heath. It is not uncommon for a week to elapse between the check deposit date and the payment being posted to the student's record. Once the payment is posted, NTS authorizes Heath to release appropriate kits. There seems to be a delay of up to two weeks at Heath before a kit is mailed. NTS requires the student to wait at least a month after the expected arrival date of the kit before initiating a follow-up. There is a very good reason why NTS requires a month delay before following up on a kit—there appears to be no feedback from Heath to NTS on which kits have been mailed to a student. The delay is intended to avoid duplication of kit releases. It is conceivable that a kit could take up to six to eight weeks (mail delay included) to arrive. Lesson materials are not subject to that delay because they are mailed directly from NTS. Therefore it is possible for a student trying to progress at an accelerated rate to have completed all the lessons well before finishing the computer.

Comprehension of the material presented in the BASIC programming section of the last phase would be greatly enhanced by having a computer with which to work (the lessons are geared toward having a computer available, although it is possible to finish the course without having access to a computer). The final exam, which is solely programming problems, is far easier when taken at a computer.

An integral part of a correspondence course is the student services offered by the school. At NTS, a newly enrolled student is assigned to a course adviser, whose function is to act as a coordinator between the student and the school. Presumably, the adviser should facilitate responses to student inquiries, be familiar with the student's record and be able to answer questions of an administrative nature either over the telephone or by mail. In practice, such is not the case. While the student is assigned to an adviser, there is no student-adviser relationship per se. There are at least four course advisers in the extension school (NTS also has a resident course). Should a student call to speak to his adviser, chances are that another adviser will handle the call.

That in itself would be no problem if student records were kept such that anyone looking at a record would be familiar with all transactions made for the student. In my case, only once in over three dozen calls made to NTS over the duration of my enrollment was I able to talk to my adviser. The rest of the calls were handled by whoever was available (I even went so far as to request that my adviser return my calls, which never happened). Frequently I found that information (on kit release dates, for example) given to me by one adviser was not the same as that given to me by someone else at a later date. The conclusion was that one or both of the advisers to whom I spoke had apparently made up the information. I quickly learned to ask for the name of the person to whom I was speaking and to keep a written record by date of all telephone conversations.

This is not to say that the advisers

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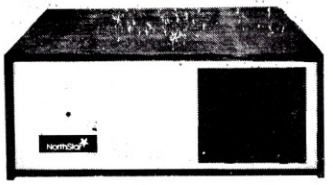

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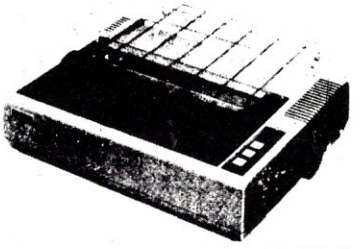

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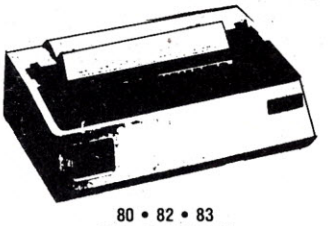

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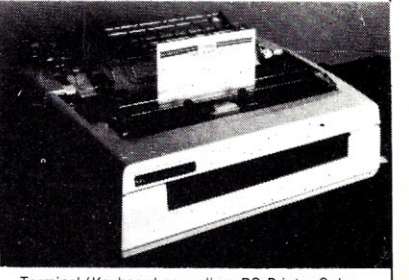

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are not conscientious—they are. But, I was told, over 7000 students are enrolled in the microprocessor courses. The advisers with whom I spoke were apparently unable to keep up with the work load. Presumably because of the work load, and delays at Heath, my kit release schedule fell far behind schedule.

Finally, in total frustration with the system, I called the school president. The manager of student services returned my call and it was through him that I finally got results. He apparently interceded on my behalf (after I told him that I intended to write a review of the course) and released my kits.

The kit and lesson release schedules are tied in to the amount of tuition paid. The prospective student is not told this, although it certainly stands to reason. There are basically two payment plans. The student may pay the full tuition price at enrollment time, in which case the total course cost is $2271, or the student may choose the time payment plan.

Under the time payment plan, the down payment required at enrollment is either $75 or $100. The monthly payment then is either $65 or $100, for a total tuition of $2576 or $2381, respectively. Initially, the incremental tuition payment (the payment which increases the balance to the point that the next set of lessons and kit is released) starts at $65, but increases to $260. The result is that, if the student chooses the smaller monthly payment plan, up to four monthly payments have to be made before the tuition balance is high enough to meet the balance requirements. The solution to the problem is clearly to increase the amount of the monthly payments. The enrollment agreement states that the student has "the right to pay off in advance the full amount due and to obtain a partial refund of the finance charge, if any provided for herein, computed on the Rule of '78s'." What that boils down to is if the full balance due is paid at once the student is entitled to a partial refund of any finance charges resulting from a time payment plan. Therefore, when payments are increased to minimize the delay between shipments, it should be kept in mind that if a large outstanding balance can be paid off at once, a sizeable finance charge saving can result.

To the credit of NTS, they did me a favor at risk to themselves. When my account was $800 short of being paid in full, I requested that they release all remaining lessons and kits. My request was based on the assurance that I would pay the balance in full within a month. I made the request because all of my kits had been shipped to me well behind schedule, and frankly, at that point I felt that doing me that favor was the least they could do. Even at that, the last two kits (floppy disk interface and HDOS) were three weeks and three telephone calls later than the other kits.

But after all the trials and tribulations of dealing with NTS, I have an operational H-89 with floppy and HDOS version 2.0. There is one acute disappointment I have with the system as received from NTS, however.

Before I enrolled I asked the then-director of enrollment if the system came with the memory upgrade kit which allows read/write memory to reside at origin zero (available from Heath for $55). I was assured that it

was; it was not. When I discovered the discrepancy I called the school. The director of education research and development to whom I was referred didn't even know what the memory upgrade was. Needless to say, NTS did not make good the upgrade to me, as the assurance I had received was not in writing.

Of interest to military service veterans who are covered under the Veterans Education Assistance Act (the G.I. Bill) is the fact that NTS is a certified training institution. Therefore, veterans who qualify for G.I. Bill benefits can receive partial reimbursement for educational expenses. Veterans who think that they qualify should contact their local VA office.

Conclusion

While it may be possible for a student to learn enough through the course to open his or her own repair business (success stories of NTS students opening their own businesses abound in the catalogue), I don't feel that successfully completing the course is a guarantee of new vocational frontiers. The information just is not detailed enough to train a student in anything but the absolute rudiments of troubleshooting a digital computer system. As stated above, there is no correlation whatever between the lesson material and the kits. If the Heath assembly manuals are followed exactly, the computer will operate correctly the first time and should not require troubleshooting. If it does fail to work, Heath provides their usual excellent troubleshooting information in the assembly manual.

Lest my experiences be written off as unfortunate, but the exception, consider this. A friend of mine enrolled in the course about a month after I did on my recommendation. I finished the course in less than nine months. He finished the course work in about ten months, in spite of some incredible delays in releasing his lesson material. He paid $1000 to pay his account in full, and even at that more than six weeks elapsed before his kits began arriving.

With the foregoing in mind, I would say that this course would probably be of interest to someone with a basic knowledge of digital electronics who wishes to learn about microprocessors in the comfort of home. I would caution the prospective student to either be very patient or be prepared to make a lot of telephone calls to NTS.■

A list of all supplementary texts and reprints (other than various appendices included with the lessons) provided to the student, in order of use:

An Introduction to Microcomputers, by A. Osborne.
Microprocessors, From Chips to Systems, by R. Zaks.
Essentials of Flowcharting, by M. Boillot, G. Gleason, & L. Horn.
The Z-80 Microcomputer Handbook, by W. Barden.
MCS-80 User's Manual, published by the Intel Corp.
Microprocessor Interfacing Techniques, by R. Zaks & A. Lesea.
"Using the 8251 Universal Synchronous/Asynchronous Receiver/Transmitter," an Intel Corp. data sheet reprint.
TV Typewriter Cookbook, by D. Lancaster.
BASIC Programming, Heathkit Continuing Education Kit EC-1100.

See List of Advertisers on page 242

This TRS-80 program is a valuable aid in both business and education in explaining statistical applications.

Normal Curve Plotter And Calculator

By Steven M. Zimmerman and
Leo M. Conrad

A picture is a great aid to using and understanding statistics. This program for the TRS-80 Model I calculates the probability and area associated with the normal distribution and draws a sketch of the curve. The program covers left tail tests, right tail tests, one side tests and balanced or unbalanced two-sided tests.

There are seven possible types of situations:

1. Left tail test—negative infinity to a value.
2. Middle to right test.
3. Right tail test—from a value to infinity.
4. Balanced two tail tests.
5. Balanced center tests.
6. Unbalanced two tail tests.
7. Unbalanced center tests.

The main restriction on this program is that the lower limit must be less than the upper limit. Otherwise, the program will not allow you to continue.

Theory

Our picture is similar to normal distribution tables. Like most normal tables the picture is built on the standard normal distribution, a normal distribution with its mean centered at zero and its standard deviation reduced to one. The (Z) equation is used to transform any given normal distribution to the standard normal: Z = (X − MU)/S, where X is any selected point on the X scale, MU is the mean of the distribution and S is sigma, the standard deviation of the distribution as measured on the X scale.

$$f(X) = \frac{e^{-.5*((X-MU)/S)[2}}{S*SQR(2*3.14)}$$

Fig. 1. Equation for generalized normal distribution. [means to raise to a power.

$$f(X) = \frac{e^{-.5\times[2}}{SQR(2*3.14)}$$

Fig. 2. Equation for the standard normal with a mean of zero and a standard deviation of 1.

The original X and Z values are simply two different scales, and are printed on the CRT. We would have printed the (X − MU) scale—centered but not reduced—if there had been room on the CRT.

The equation for the generalized normal distribution is shown in Fig. 1.

The equation for the standard normal with a mean of zero and a standard deviation of 1 is shown in Fig. 2.

The computer plots the standard normal distribution. We must stress that the difference between the standard normal and any other normal distribution is only the scale.

The program calculates the probability and area, and draws a picture of the area on the CRT. You get a value and a visualization of the problem. A Taylor series is used to calculate the area.

Running the Program

After typing RUN and hitting the enter key, Sample 1 will appear on the CRT.

The reason for organizing the program in this manner is that the first five selections parallel the normal curve tables found in general use. One of these selections should match

```
TYPE OF NORMAL CURVE

        I       LEFT SIDED      -INF <= X <= A

        II      FROM 0 TO A     0 <= X <= A

        III     RIGHT SIDED     A <= X <= INF

        IV      TWO TAILS       -INF <=X<=B   + A<=X<=INF

        V       MIDDLE          B<=X<=A

*** NOTE:FOR IV & V B=AVERAGE-A+AVERAGE ... A BALANCED TEST

        VI      UNBALANCED TWO TAILS -INF<=X<=B+A<=X<=INF

        V       UNBALANCED MIDDLE       B <= X <= A

SELECT I, II ... VII?
```

Sample 1.

Address correspondence to Steven M. Zimmerman, College of Business and Management Studies, University of South Alabama, Mobile, AL 36688, and Leo M. Conrad, Imagineering Concepts, PO Box 9843, Mobile, AL 36691.

```
10 CLEAR500:REM      "ZCURVE/BAS"
20 CLS:PRINT"NORMAL CURVE PLOTTER AND CALCULATOR"
30 PRINT
40 I=0:PRINT"DEVELOPED BY: STEVEN M. ZIMMERMAN, Ph. D.    1980"
50 PRINT
60 PRINT"TYPE OF NORMAL CURVE"
70 PRINT"     I     LEFT SIDED  -INF <= X <= A"
80 PRINT"     II    FROM 0 TO A    0 <= X <= A"
90 PRINT"     III   RIGHT SIDED    A <= X <= INF"
100 PRINT"     IV    TWO TAILS    -INF <= X <= B  + A <= X <= INF"
110 PRINT"     V     MIDDLE      B <= X  <= A"
120 PRINT" ** NOTE:FOR IV & V B=AVERAGE-A+AVERAGE ... A BALANCED TEST"
130 PRINT"     VI    UNBALANCED TWO TAILS-INF <=X <= B  + A <= X <= INF"
140 PRINT"     VII   UNBALANCED     B <= X <= A"
150 INPUT"SELECT I, II, ... VII";BB$
160 REM CALCULATION OF AREA
170 INPUT"AVERAGE AND STANDARD DEVIATION (0 & 1 FOR STANDARD NORMAL)";AA,SD
180 IFBB$="I" OR BB$="II" OR BB$="III" OR BB$="IV" OR BB$="V" THEN INPUT"A LIMIT(S)";X1:X2=AA-X1+AA:Z2=(X2-AA)/SD:GOTO210
190 IFBB$="VI" OR BB$="VII" THEN INPUT"LOWER LIMIT B AND UPPER LIMIT A";X2,X1:Z2=(X2-AA)/SD:GOTO210
200 GOTO50
210 Z1=(X1-AA)/SD:X=Z1:GOTO270
220 FL=0:IFX<0THENFL=1:X=-X
230 A=.4361836:B=-.1201676:C=.937298
240 D=(2.718281828(-X^2/2))*(2*3.1415926)^(-.5)
250 E=(1+.3326*X)^(-1)
260 P=.5-D*(A*E+B*E^2+C*E^3):RETURN
270 GOSUB220  :IFBB$<>"I"THEN300
280 IFFL=1:P=.5-P:GOTO520
290 P=.5+P:GOTO520
300 IFBB$<>"II"THEN330
310 IFFL=0THEN520
320 INPUT"ERROR CAN NOT BE LESS THAN ZERO FOR TYPE II -ENTER TO CONTINUE";DD$:GOTO10
330 IFBB$<>"III"THEN360
340 IFFL=0THENP=.5-P:GOTO520
350 P=.5+P:GOTO520
360 IFBB$<>"IV"THEN390
370 IFZ1<0THENINPUT"ERROR ... CAN NOT HAVE NEGATIVE H... ENTER TO CONTINUE";DD$:GOTO10
380 P=2*(.5-P):GOTO520
390 IFBB$<>"V"THEN420
400 IFZ1<0THEN370
410 P=2*P:GOTO520
420 IFBB$<>"VI"THEN470
430 IFZ1<Z2THENINPUT"ERROR UPPER LIMIT < LOWER LIMIT-ENTER TO CONTINUE";DD$:GOTO10
440 IFZ1>=0 AND Z2<=0 THENPP=.5-P:X=Z2:GOSUB220  :P=PP+.5-P:GOTO520
450 IFZ1>=0 AND Z2>=0THEN PP=.5-P:X=Z2:GOSUB220  :P=PP+.5+P:GOTO520
460 IFZ1<=0 AND Z2<=0 THEN PP=.5+P:X=Z2:GOSUB220  :P=PP-P+.5:GOTO520
470 IFBB$<>"VII"THEN20
480 IFZ1<Z2THENINPUT"ERROR UPPER LIMIT < LOWER LIMIT-ENTER TO CONTINUE";DD$:GOTO10
490 IFZ1>=0ANDZ2<=0THENPP=P:X=Z2:GOSUB220  :P=PP+P:GOTO520
500 IFZ1>=0ANDZ2>=0THENPP=P:X=Z2:GOSUB220  :P=PP-P:GOTO520
510 IFZ1<=0ANDZ2<=0THEN PP=P:X=Z2:GOSUB220  :P=P-PP
520 REM END OF AREA CALCULATIONS
530 INPUT"LOWER AND UPPER LIMITS FOR PICTURE";SX,TX
540 INPUT"HARD COPY (Y/N)";P$:IFP$="N"THEN570
550 IFP$<>"Y"THEN540
560 INPUT"TITLE, DATE AND OPERATOR";T$,D$,O$
570 REM BEGINNING OF GRAPHICS
580 CLS:PRINT@88,"TYPE "BB$;:PRINT@140,"AREA= ";P;" AVG= ";AA;" STD DEV. = ";SD
590 PRINT@204,"A= ";X1;:IFBB$="IV"ORBB$="V"ORBB$="VI"ORBB$="VII"THENPRINT@240," B=";X2
600 SY=0:TY=1/2:REM DEFINES LIMITS OF F(X)
610 I=7:FORJ=64T0832STEP128:I=I-1:PRINT@J,(SY+I*(TY-SY)/6);:NEXT
620 PRINT@896,"X";
630 I=-1:PRINT@960,"Z";:FORJ=970T01015STEP9:I=I+1:PRINT@J-64,((SX+I*(TX-SX)/5)*SD+AA);:PRINT@J,(SX+I*(TX-SX)/5);:NEXT
640 GOTO680
650 PRINT@22,"PRESS ENTER TO CONTINUE";
660 G$=INKEY$:IFG$=""THEN650  ELSE
670 REM PLOT NORMAL CURVE
680 S=(TX-SX)/60
690 FORX=SXTOTXSTEPS:Y=(1/(SQR(2*3.411592654)))*2.718281828(-X^2/2)
700 E=23+((X-SX)/(TX-SX))*93:F=40-((Y-SY)/(TY-SY))*37:IFE>5ANDE<126THENIFF>0ANDF<45 SET(E,F) ELSE PRINT@61,"***";:FORL=1T010:R=RND(1
00):NEXTL:PRINT@61,"   ";
710 IFBB$="I"ANDX<=Z1THEN960
720 IFBB$="II"ANDX<=Z1ANDX>=0THEN960
730 IFBB$="III"ANDX>=Z1THEN960
740 IFBB$="IV"ANDX<=Z2THEN960
750 IFBB$="IV"ANDX>=Z1THEN960
760 IFBB$="V"ANDX>=Z2ANDX<=Z1THEN960
770 IFBB$="VI"ANDX<=Z2THEN960
780 IFBB$="VI"ANDX>=Z1THEN960
790 IFBB$="VII"ANDX>=Z2ANDX<=Z1THEN960
800 NEXT
810 IFP$="Y"THEN840
820 PRINT@22,"PRESS ENTER TO CONTINUE";
830 W$=INKEY$:IFW$=""THEN820  ELSE 20
840 REM HARD COPY ROUTINE ***** COPIES ALL ON SCREEN *******
850 LPRINT" "
860 LPRINT"TITLE: ";T$;"  DATE: ";D$
870 LPRINT"PREPARED BY: ";O$
880 FORI=1T04:LPRINT" ":NEXT
890 FORR=0T015:A=15360+R*64:FORC=0T063
900 B=A+C:D=PEEK(B)
910 IFD>=129 AND D<=191 THEN LPRINT"*"; ELSE LPRINTCHR$(D);
920 NEXTC
930 LPRINT" "
940 NEXTR
950 GOTO820
960 FOR2A=FT041:SET(E,2A):NEXT:GOTO800
```

Program listing. Normal Curve and Plotter program in TRS-80 BASIC.

the normal curve table you have available. The program will be more valuable if you spend the time to relate it to your previous experience. Types VI and VII were developed to increase the flexibility and area of application of the program. I don't know of any tables which match these last two cases.

We've included runs for each type of curve. When running types I to V, the questions you must answer are all the same. Types VI and VII require one additional piece of information, since the lower limit and upper limit are controlled independently.

We will continue with our example assuming (I) was the answer given to the above question. The program proceeds:

```
AVERAGE AND STANDARD DEVIATION
(0 & 1 FOR STANDARD NORMAL)?
```

For our type I example, the answer given to the above question was 10, 2. The average was specified as 10 and the standard deviation as 2.

```
A LIMIT(S)?
```

You must answer this question with a number on the X scale. In the case of the type I and III curves, this value has no limits. In the case of

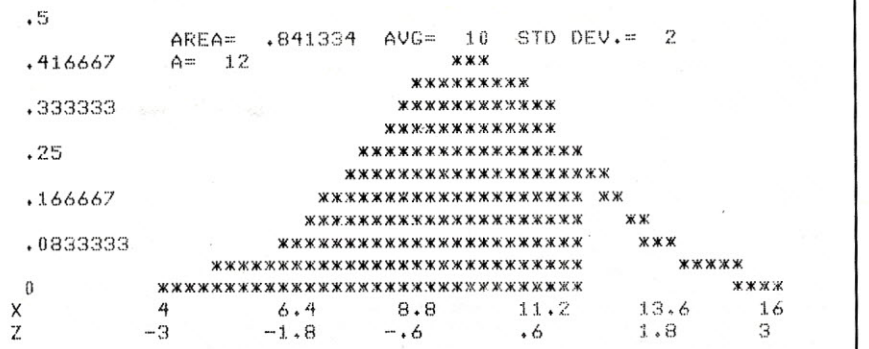

Fig. 3. Type I curve.

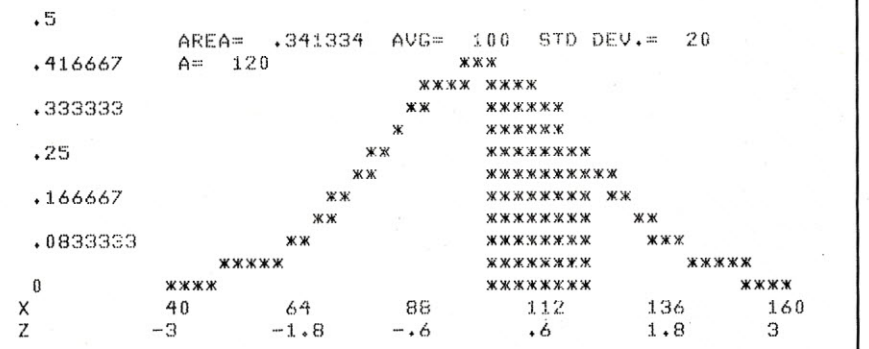

Fig. 4. Type II curve.

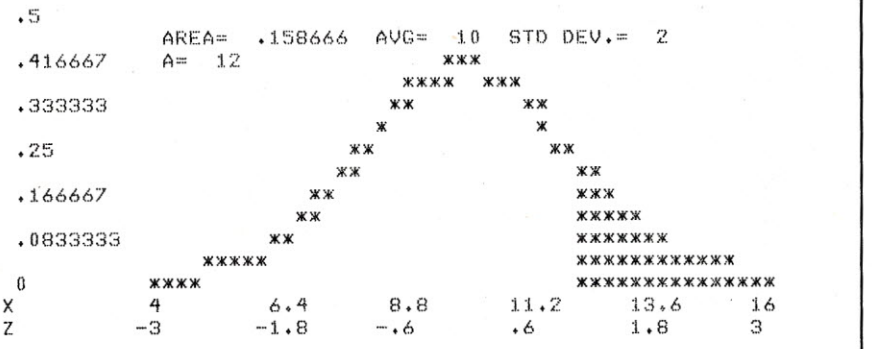

Fig. 5. Type III curve.

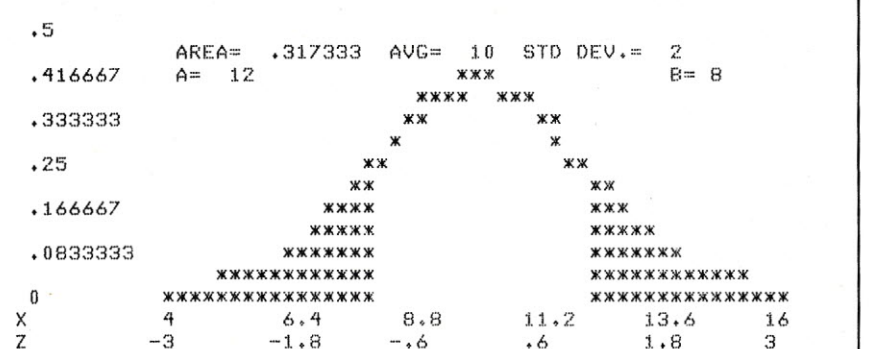

Fig. 6. Type IV curve.

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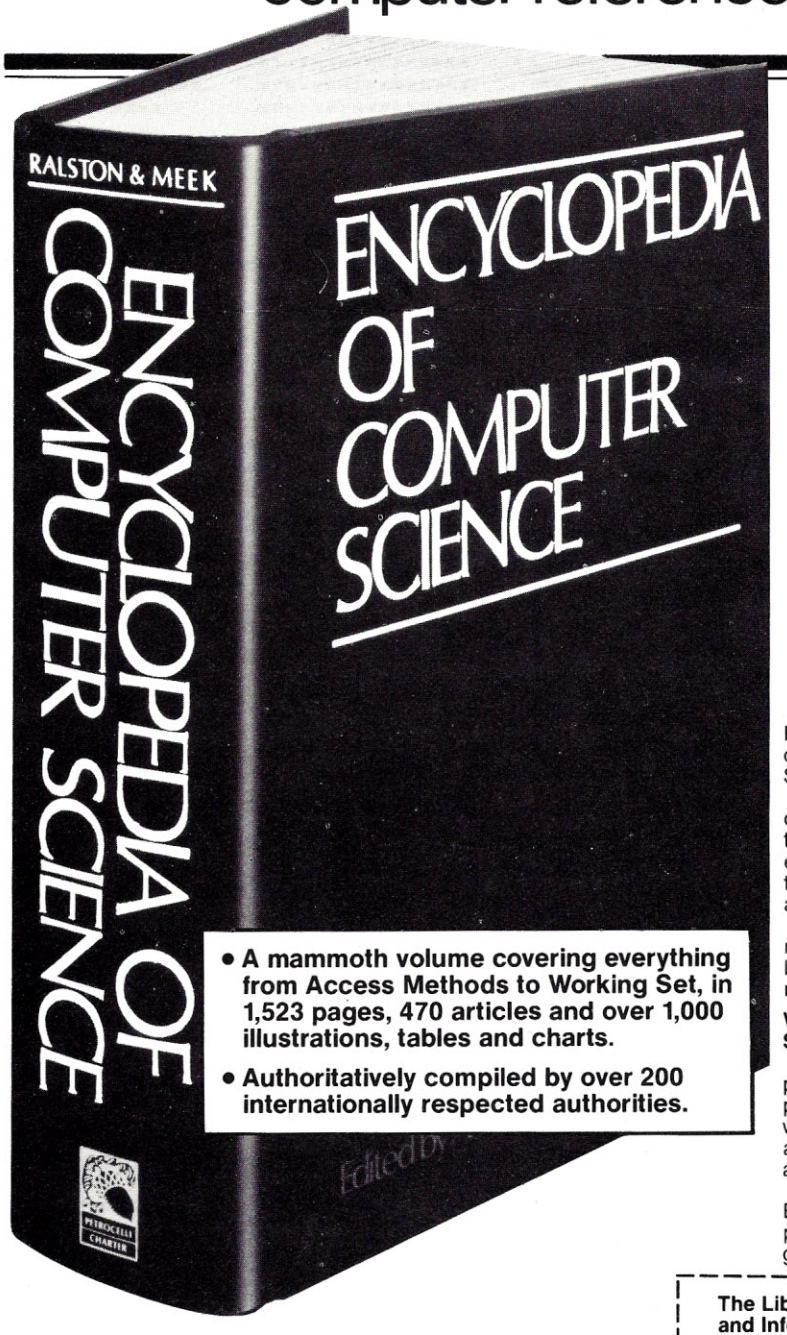

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type II, type IV and type V curves, the value of A must be greater than the mean. Otherwise, you won't be allowed to continue. In the case of the type II curve, you would be beyond the range of the application. For the type IV and V curves, a value lower than the average means the lower limit is being specified as a value greater than the upper limit.

Our answer to the above question was 12. The area we are seeking is for a normal curve with a mean of 10 and a standard deviation of 2 from negative infinity to 12.

LOWER AND UPPER LIMITS FOR PICTURE?

The answer to this question must be answered relative to the Z scale. These values are to be used to draw the picture on the CRT. All of the pictures we drew went from −3 to +3, ±3 sigma limits, on the Z scale. We usually use the three sigma limits. From time to time we like to select other limits to illustrate some specific idea.

The program can copy the CRT onto your printer. If you select this option you may add identification information. If you don't want hard copy, go directly into the program execution after the question about hard copy.

Conclusion

The normal curve and plotter program has proven its value in the classroom and the boardroom. It has helped to sell ideas and to explain the concepts behind statistical applications. It should be a valuable addition to your library.■

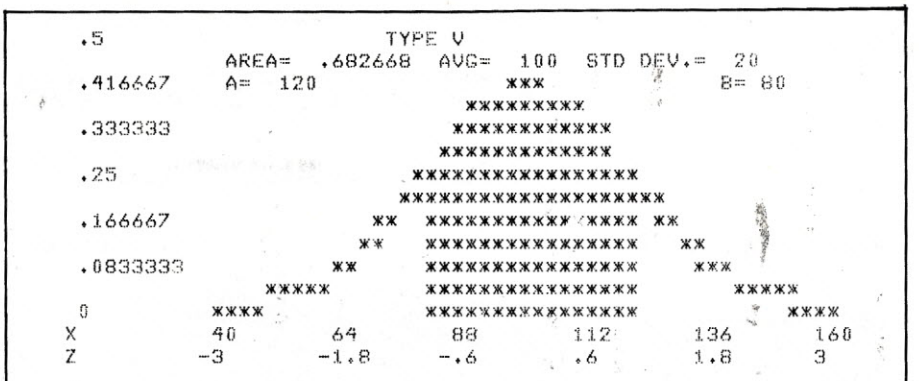

Fig. 7. Type V curve.

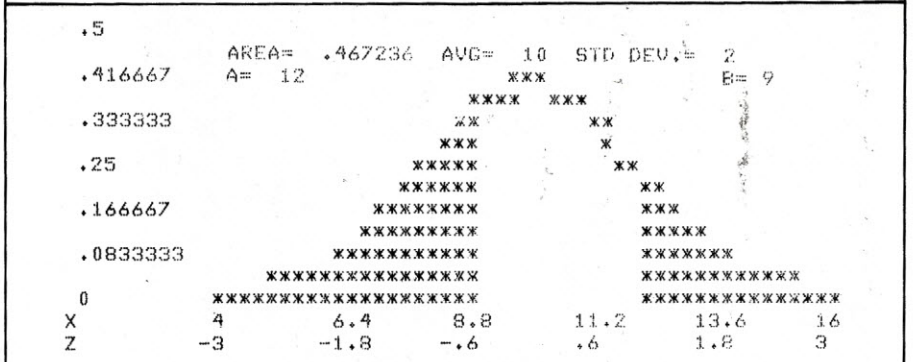

Fig. 8. Type VI curve.

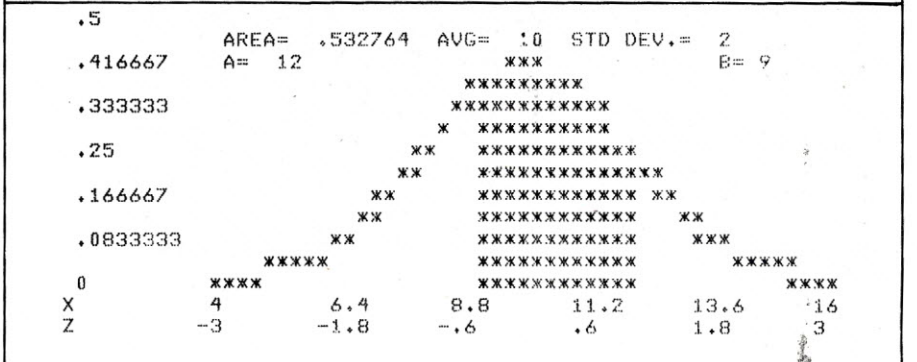

Fig. 9. Type VII curve.

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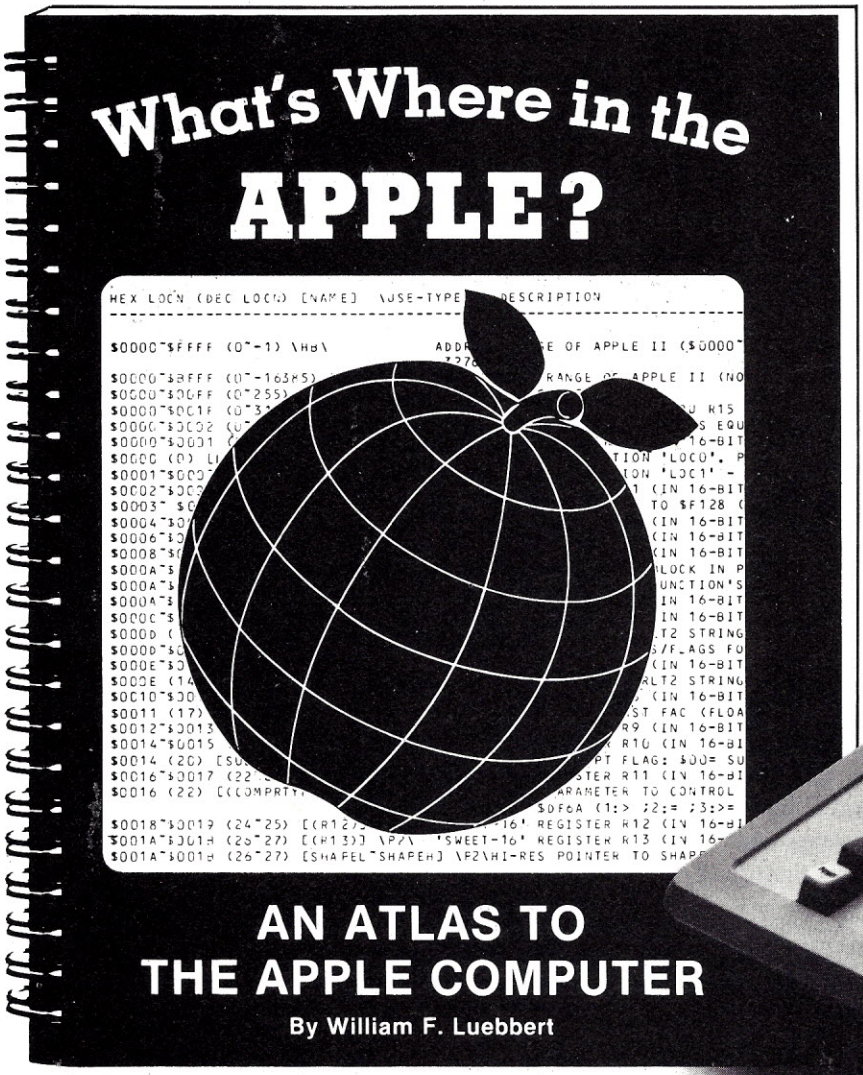

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Even in this so-called "off election" year, many local contests are heating up. This PET program lets you analyze the votes as they come in on election night.

PET Goes to the Polls

By Gary Greenberg

One of my major gripes about microcomputer magazines is that most of the classy software is written for people with full-blast systems that include disks and printers. All that the hobbyists get are games and programs that tell you what day of the week Oct. 10, 1642, AD fell on.

As the owner of an $800 PET, a system worth over a million dollars ten years ago, I wanted to do something earthshaking. I hate playing games on the machine. I could have bought a TV game console for a lot less and still had a million dollar system from ten years ago. Also, I had no need for ledgers, accounts receivable and payroll plans.

After thinking about the problem for a while, I finally came up with a need for my PET. I am active in a political organization known as the Libertarian Party. One of the more bizarre features of this organization is that a high percentage of its members are associated with the computer industry.

My problem was this: I wanted to know how our party's vote totals compared from one race to another and from one district to another.

To give you a perspective on the problem, I wanted to maintain the results of the 1976 presidential race for 12 political parties, keeping track of the results in the 50 states as well as the vote breakdown for that race in New York City's 65 assembly districts and New York State's 62 counties. And this was only one of dozens of elections I wanted to keep track of.

In implementing this system I was confined by the lack of a printer and left with the use of a video screen capable of holding a total of 1000 characters. My only peripheral was the second cassette recorder.

To my great dismay, after designing and typing in a great amount of software, I learned of the PET's 225-element array limitation. This left me with much grief and little useful program material.

Back at the old drawing board and CRT, I redesigned the software and had it up and running on the computer. This is the system described below.

One at a Time

In dealing with the array problem I was only able to examine one political party at a time. There may be other solutions that implement multiple arrays and permit simultaneous examination of more than one party at a time. Unfortunately, I didn't pursue that line because I subsequently upgraded to a new model PET that doesn't have the array problem and I am designing a much more efficient set of programs. I still have the small screen to work with, but I don't find that to be too much of a discomfort.

The system consists of six programs: COUNTY CREATE, VOTESORT, VOTEPLACE, VOTETARGET, COMPARE and VOTEEDIT.

The key program is COUNTY CREATE, which sets up a formatted file. In this case, the file is based on vote results in New York State's counties. You can amend this program to account for any set or group of political subdivisions you want. They don't even have to be districts of the same type. You can mingle counties, cities, congressional districts or whatever else you have. You do this by typing into the data statements the names of the districts you want and eliminating from the data statements those districts you don't want.

You must also be aware of the number of districts you have in the data statements. As the program is currently set up, line 130 asks you how many districts you are entering data for. Since writing this program I concluded that this permitted an unnecessary opportunity for operator error. Since the number of districts will be the same every time the program is run, I would replace line 130 with the following new line 130, placing the number of districts between the quotation marks:

```
130 D$=" "
```

Line 200 is required before opening up files on the old PET. I don't believe it is necessary on the new PET, but running the old program on my new PET doesn't seem to have had

Gary Greenberg (35-63 80th St., Jackson Heights, NY 11372) is an attorney and computer hobbyist who has authored several computer articles.

any adverse effects, even though many POKE locations have been changed.

Subroutine 5000 is also necessary on the old PETs if you are using files. The effect of this subroutine is to count the number of characters in the cassette buffer and turn the cassette motor on to advance the tape after a buffer is emptied onto the tape. Again, I don't think it is necessary on the new machines but there have been no problems using it on the new machine. It probably results in a slightly longer time to read and write the data files.

The file is formatted in the following manner. The first four elements in order are the number of parties, number of districts, name of the race and then the year of the race. Line 150 truncates the year entry to the last two digits in the event you enter all four digits in the year. After that data is entered, you are given a chance to correct it before the data is written to the file.

Next, you are asked for the names of the parties. The order of party entry determines the order in which the vote data is entered. Again, after the parties are entered, you are given a chance to make corrections before recording.

When you finish entering the parties, you are then given the name of a district and asked for each party's vote. When the district's votes are entered you can review it for errors before recording. Once the record signal is given, the computer writes the name of the district to the file, followed by the votes for each party in the order entered in the party entry portion of the program. The program then loops through all the data statements until the votes are all entered.

One note about the correction opportunities. Even though the error is recognized in the middle of the entry segment, you have to wait until the end of sequence. Of course, as long as you don't hit return after making an entry, you can still backspace and correct. When I am entering data for a district and I realize I made an entry error on one of the vote figures, I enter zeroes for the remainder of the district and start over with all correct data.

Program listing. COUNTY CREATE.

```
10 REM   COUNTY CREATE
11 REM   CREATES FILES FROM KB INPUT
12 REM   BY
13 REM   GARY GREENBERG
100 DIMV$(13),P$(13):PRINT"□":GOSUB9000
110 PRINT:PRINT"PLACE BLANK TAPE IN C-1"
120 PRINT:INPUT"HOW MANY PARTIES";P$
130 PRINT:INPUT"HOW MANY DISTRICTS";D$
140 PRINT:INPUT"NAME OF RACE";R$
150 PRINT:INPUT"YEAR OF RACE";Y$:Y$=RIGHT$(Y$,2)
160 FL$=R$+Y$:PRINT:GOSUB9000
170 PRINT:PRINTP$;" PARTIES":PRINT:PRINTD$;" DISTRICTS"
180 PRINT:PRINTR$,Y$:PRINT:GOSUB9000:INPUT"IS THIS INFORMATION CORRECT";Z$
190 IFLEFT$(Z$,1)<>"Y"THENPRINT"□";:GOSUB9000:GOTO120
200 POKE243,122:POKE244,2
240 OPEN1,1,2,FL$:SZ=0
250 PRINT#1,P$:T$=P$:GOSUB5000:P=VAL(P$)
260 PRINT#1,D$:T$=D$:GOSUB5000:D=VAL(D$)
270 PRINT#1,R$:T$=R$:GOSUB5000
280 PRINT#1,Y$:T$=Y$:GOSUB5000
290 GOSUB9000:FORI=1TOP
300 PRINT:PRINT"PARTY #";I;:INPUTP$(I):NEXTI
310 PRINT:GOSUB9000:INPUT"IS THIS INFORMATION CORRECT";Z$
320 IFLEFT$(Z$,1)<>"Y"THEN290
330 FORI=1TOP
340 PRINT#1,P$(I):T$=P$(I):GOSUB5000
350 NEXTI
360 FORJ=1TOD:GOSUB9000
370 READD$:IFLEN(D$)>10THEND$=LEFT$(D$,10)
380 PRINT#1,D$:T$=D$:GOSUB5000
390 PRINTD$:GOSUB9000
400 FORI=1TOP
410 PRINT"VOTE FOR ";P$(I),:INPUTV$(I):NEXTI:GOSUB9000
420 PRINT:INPUT"IS DATA CORRECT";Z$
430 GOSUB9000
440 IFLEFT$(Z$,1)<>"Y"THEN390
450 FORK=1TOP
460 PRINT#1,V$(K):T$=V$(K):GOSUB5000
470 NEXTK
480 NEXTJ
490 CLOSE1
500 PRINT"DONE"
900 END
1000 REM   COUNTY DATA STARTS 1220
1220 DATA BRONX
1230 DATA KINGS
1240 DATA "NEW YORK"
1250 DATA QUEENS
1260 DATA RICHMOND
1270 DATA NASSAU
1280 DATA SUFFOLK
1290 DATA WESTCHESTER
1300 DATA ROCKLAND
1310 DATA ALBANY
```

More →

T/Maker II:™ it does a number on VisiCalc™!

VisiCalc is a fine aid for the computation of numerical problems. But it does have two major limitations: it is available only for a small number of systems, and its use is limited strictly to numbers, not words. To overcome these substantial limitations, Lifeboat Associates introduces T/Maker II.

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- Profitability Reports
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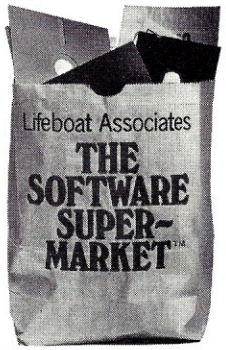

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As an example of what T/Maker II can do, see the chart below. The operator entered only the data shown in boldface. T/Maker II calculated and reported all the other values.

	— Actual —			Growth		Total	—Projected—		
	1978	1979	1980	Rate	Average	(000's)	1981	1982 *	1985
Item A	**42,323**	**51,891**	**65,123**	24.04	53,112	159.34	80,782	100,206	191,262
Item B	**45,671**	**46,128**	**49,088**	3.67	46,962	140.89	50,891	52,761	58,791
Total	87,994	98,019	114,211	13.93	100,075	300.22	131,673	152,966	250,053
% Item	48.10	52.94	57.02	8.88	52.69	158.1	61.35	65.51	76.49
% Item	51.90	47.06	42.98	-9.00	47.31	141.9	38.65	34.49	23.51
Total	100.00	100.00	100.00	—	100.00	300.0	100.00	100.00	100.00

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COUNTY CREATE listing continued.

```
1320 DATA ALLEGANY
1330 DATA BROOME
1340 DATA CATTARAUGUS
1350 DATA CAYUGA
1360 DATA CHATAUQUA
1370 DATA CHEMUNG
1380 DATA CHENANGO
1390 DATA CLINTON
1400 DATA COLUMBIA
1410 DATA CORTLAND
1420 DATA DELAWARE
1430 DATA DUTCHESS
1440 DATA ERIE
1450 DATA ESSEX
1460 DATA FRANKLIN
1470 DATA FULTON
1480 DATA GENESEE
1490 DATA GREENE
1500 DATA HAMILTON
1510 DATA HERKIMER
1520 DATA JEFFERSON
1530 DATA LEWIS
1540 DATA LIVINGSTON
1550 DATA MADISON
1560 DATA MONROE
1570 DATA MONTGOMERY
1580 DATA NIAGARA
1590 DATA ONEIDA
1600 DATA ONONDAGA
1610 DATA ONTARIO
1620 DATA ORANGE
1630 DATA ORLEANS
1640 DATA OSWEGO
1650 DATA OTSEGO
1660 DATA PUTNAM
1670 DATA RENSSELAER
1680 DATA "ST.LAWRENCE"
1690 DATA SARATOGA
1700 DATA SCHENECTADY
1710 DATA SCHOHARIE
1720 DATA SCHUYLER
1730 DATA SENECA
1740 DATA STEUBEN
1750 DATA SULLIVAN
1760 DATA TIOGA
1770 DATA TOMPKINS
1780 DATA ULSTER
1790 DATA WARREN
1800 DATA WASHINGTON
1810 DATA WAYNE
1820 DATA WYOMING
1830 DATA YATES
4990 GOTO9999
5000 REM   CHECK BUFFER FULL
5010 SZ=SZ+LEN(T$)+1
5020 IFSZ<192GOTO5100
5030 POKE59411,53
5040 T=TI
5050 IF(TI-T)<6GOTO5050
5060 POKE59411,61
5070 SZ=SZ-191
5100 RETURN
9000 FORI9=1TO39:PRINT"■";:NEXTI9:PRINT:RETURN
9999 END
```

Program listing. VOTESORT.

```
 10 DIMP$(20),DN$(74),V(74),VV(74)
 20 PRINT"□":C=0:C1=0:L3=20
 30 PRINT:PRINT
 40 GOSUB6000:PRINT
 50 PRINTTAB(14);"VOTESORT":PRINT
 60 PRINTTAB(10);"BY":PRINT
 70 PRINTTAB(11);"GARY  GREENBERG":PRINT
 75 GOSUB6000:PRINT:PRINTTAB(9);"INSERT DATA IN C-1":PRINT
 80 GOSUB6000:PRINT:PRINTTAB(8);"HIT ANY KEY TO START.":PRINT
 90 GOSUB6000:PRINT
100 GOSUB9010
110 PRINT"□";
160 GOSUB6000:PRINT:INPUT"WHICH PARTY";WP$:PRINT
170 GOSUB6000:PRINT:INPUT"DO YOU WANT VOTE DISPLAY INTERRUPTED";Z$
180 IFLEFT$(Z$,1)="N"THENC=1
190 PRINT:GOSUB6000:PRINT:INPUT"PRINT VOTE ONLY IF OVER WHAT %";PC:PRINT:GOSUB6
000
200 OPEN1
205 INPUT#1,P$:IF64ANDSTTHEN561
210 P=VAL(P$)
220 INPUT#1,D$:D=VAL(D$)
230 INPUT#1,R$
240 INPUT#1,V$
250 FORI=1TOP:INPUT#1,P$(I)
260 IFWP$=P$(I)THENWP=I
270 NEXTI
490 GOSUB3000
500 FORI=1TOD:INPUT#1,DN$(I):V=0
510 FORJ=1TOP:INPUT#1,V$:V1=VAL(V$)
520 V=V+V1
530 IFJ=WPTHENV(I)=V1
540 NEXTJ
550 VV(I)=INT(10000*V(I)/V)/100:GOSUB5000
560 NEXTI
561 CLOSE1
562 IFC=0THENGOSUB6000:GOSUB9000
```

More →

VOTESORT listing continued.

```
565 PRINT"□";:GOSUB6000:PRINT:PRINTR$;"-";V$,WP$:PRINT
570 GOSUB6000:PRINT:INPUT"DO YOU WANT 'BEST VOTE' SORT";Z$:PRINT
575 IFLEFT$(Z$,1)="N"THEN655
580 PRINT"□",R$;"-";V$:PRINT:PRINT"BEST VOTE SORT":PRINT:PRINTWP$
585 PRINT:PRINT"WORKING"
590 K=D-1
600 FORI=1TOK:X=I:Y1=V(I):Y2=VV(I):YD$=DN$(I)
605 FORJ=I+1TOD
610 IFY1<V(J)THEN630
620 Y1=V(J):Y2=VV(J):YD$=DN$(J):X=J
630 NEXTJ
640 V(X)=V(I):VV(X)=VV(I):DN$(X)=DN$(I)
645 V(I)=Y1:VV(I)=Y2:DN$(I)=YD$
650 NEXTI
651 PRINT"□";
652 GOSUB2000
655 GOSUB6000:PRINT:INPUT"DO YOU WANT 'BEST % ' SORT";Z$:IFLEFT$(Z$,1)="N"THEN9
00
657 PRINT"□",R$;"-"Y$:PRINT:PRINT"BEST-% SORT":PRINT:PRINTWP$
658 PRINT:PRINT"WORKING"
660 K=D-1
670 FORI=1TOK:X=I:Y1=V(I):Y2=VV(I):YD$=DN$(I)
675 FORJ=I+1TOD
680 IFY2<VV(J)THEN700
690 Y1=V(J):Y2=VV(J):YD$=DN$(J):X=J
700 NEXTJ
710 V(X)=V(I):VV(X)=VV(I):DN$(X)=DN$(I)
715 V(I)=Y1:VV(I)=Y2:DN$(I)=YD$
720 NEXTI
725 PRINT"□"
730 GOSUB2000:GOSUB6000:GOSUB9000
900 PRINT:GOSUB6000:PRINT"DONE":END
2000 L1=1
2010 GOSUB9200
2030 FORL=DTO1STEP-1
2040 PRINTL1;TAB(5);DN$(L);
2050 Y=V(L):GOSUB4000:PRINTTAB(20+X);V(L);
2060 Y=VV(L):GOSUB4100:PRINTTAB(30+X);:V1$=STR$(VV(L))
2063 IFVV(L)=INT(VV(L))THENV1$=V1$+".00"
2065 PRINTV1$
2070 IFL1/15=INT(L1/15)THENGOSUB6000:GOSUB9000:PRINT"□";:GOSUB9200
2080 L1=L1+1
2090 NEXTL
2100 RETURN
3000 PRINT"□";:GOSUB6000:PRINTR$;"-";V$,WP$:GOSUB6000
3010 RETURN
4000 X$=STR$(Y):X1=LEN(X$):X=7-X1:RETURN
4100 IFY<1THENX=2
4110 IFY>=1ANDY<10THENX=1
4120 IFY>=10THENX=0
4130 RETURN
5000 IFVV(I)<PCTHEN5100
5010 PRINTDN$(I);:Y=V(I):GOSUB4000:PRINTTAB(20+X);V(I);
5020 Y=VV(I):GOSUB4100:PRINTTAB(30+X);
5025 V1$=STR$(VV(I))
5030 IFVV(I)=INT(VV(I))THENV1$=V1$+".00"
5040 C1=C1+1
5050 PRINTV1$:IFC1/9<>INT(C1/9)ANDC=0THENPRINT
5060 IFC=1THEN5100
5070 IFC1/9=INT(C1/9)THENGOSUB6000:GOSUB9000:GOSUB3000
5100 RETURN
6000 FORI9=1TO39:PRINT"*";:NEXTI9:PRINT:RETURN
9000 PRINT"HIT ANY KEY":GOSUB6000
9010 GET Q$:IFQ$=""THEN9010
9020 RETURN
9200 GOSUB6000:PRINTR$;"-";V$,WP$:GOSUB6000
9210 PRINT"RANK";TAB(5);"DISTRICT";TAB(23);"VOTE";TAB(30);"PER CENT"
9220 PRINT"----";TAB(5);"--------";TAB(23);"----";TAB(30);"--------"
9230 RETURN
9999 END
```

Program listing. VOTEPLACE.

```
10 DIMP$(20),P1$(20),V(20),VV(20)
20 PRINT"□"
30 PRINT:PRINT
40 GOSUB6000
50 PRINTTAB(14);"VOTEPLACE":PRINT
60 PRINTTAB(10);" BY":PRINT
70 PRINTTAB(11);"GARY  GREENBERG":PRINT
75 GOSUB6000:PRINTTAB(9);"INSERT DATA IN C-1":PRINT
80 PRINTTAB(8);"PRESS RETURN TO CONTINUE.":PRINT
90 GOSUB6000
100 GET Q$:IFQ$=""THEN100
110 PRINT"□";:GOSUB6000
130 PRINT"1) CHOOSE SPECIFIC DISTRICT."
140 PRINT"2) RUN ALL DISTRICTS."
150 GOSUB6000
160 INPUT"COMMAND";C:C=INT(ABS(C))
180 IFC<1ORC>2THEN160
190 IFC=1THENINPUT"WHICH DISTRICT";WD$
200 OPEN1
210 INPUT#1,P$:IF64ANDSTTHEN500
220 P=VAL(P$)
230 INPUT#1,D$:D=VAL(D$)
240 INPUT#1,R$
250 INPUT#1,V$
260 FORI=1TOP
270 INPUT#1,P$(I)
280 NEXTI
400 FORI=1TOD:INPUT#1,DN$:V=0
```

More

Subroutine 9000 is a simple routine for drawing a line across the screen consisting of a single character repeated 39 times. Just substitute the desired symbol between the quotation marks in the PRINT statement.

The program I use most in accessing the data is VOTESORT. For any party you can have the districts sorted by highest vote total, and then by highest percentage total. One other feature of this program is that while the data is being read in to the computer, you can get a screen display of all those districts in which the vote total exceeded the percentage you select.

In doing this sort I came up with a new algorithm that is simple, and, on small lists, much faster than most sorts I have seen discussed in the magazines. For example, on a list of ten it is 30 percent faster than the very fast, but complex, Quicksort. On a list of 25 it ties Quicksort. I don't know if this routine is original, but for now I call it G-SORT.

The increased speed from this sort is due to the minimization of exchanges and comparisons, which is

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VOTEPLACE listing continued.

```
  410 FORJ=1TOP:INPUT#1,V$:V(J)=VAL(V$)
  420 V=V+V(J)
  430 NEXTJ
  435 WD=0:IFC=1THENGOSUB1500
  436 IFWD=1THEN480
  440 FORJ=1TOP:VV(J)=INT(10000*V(J)/V)/100
  450 NEXTJ
  460 GOSUB1000
  470 GOSUB3000
  480 NEXTI
  500 CLOSE1:PRINT"DONE":END
 1000 K=P-1:FORL=1TOP:P1$(L)=P$(L):NEXTL
 1010 FORJ=1TOK
 1020 IFV(J)<=V(J+1)THEN1040
 1030 GOSUB2000
 1040 NEXTJ
 1050 K=K-1
 1060 IFK>=1THEN1010
 1070 RETURN
 1500 LW=LEN(WD$)
 1510 IFLEFT$(DN$,LW)<>WD$THENWD=1
 2000 X=V(J):X1=VV(J):X$=P1$(J)
 2020 V(J)=V(J+1):VV(J)=VV(J+1):P1$(J)=P1$(J+1)
 2030 V(J+1)=X:VV(J+1)=X1:P1$(J+1)=X$
 2040 RETURN
 2500 IFVV(J)<1THENW=3
 2510 IFVV(J)>=10THENW=1
 2520 IFVV(J)>=1ANDVV(J)<10THENW=2
 2530 RETURN
 3000 PRINT"□";:GOSUB6000:PRINTR$;TAB(20);Y$;TAB(27);DN$:PRINT:GOSUB6000
 3010 FORJ=PTO1STEP-1:V1$=STR$(VV(J))
 3020 W=LEN(STR$(INT(V(J))-1):W=7-W
 3030 PRINTP-J+1;TAB(4);P1$(J);TAB(20+W);V(J);
 3040 IFVV(J)=INT(VV(J))THENV1$=V1$+".00"
 3050 GOSUB2500
 3060 PRINTTAB(30+W);V1$
 3065 NEXTJ
 3070 GOSUB6000:PRINT"PRESS RETURN TO CONTINUE";Z$
 3075 GETA$:IFA$=""THEN3075
 3076 PRINT"SEARCHING FURTHER"
 3080 RETURN
 6000 FORI9=1TO39:PRINT"※";:NEXTI9:PRINT:PRINT:RETURN
READY.
```

Program listing. VOTETARGET.

```
10 REM  VOTETARGET
11 REM  BY GARY GREENBERG
12 REM
20 PRINT"□";:PRINT:PRINT:GOSUB6000
30 PRINT:PRINTTAB(14);"VOTETARGET":PRINT
40 PRINTTAB(10);"COPYRIGHT 1980 BY":PRINT
50 PRINTTAB(11);"GARY GREENBERG":PRINT
55 GOSUB6000:GOSUB6100
60 PRINT"□":GOSUB6000:PRINT:PRINT"YOU MAY SELECT UP TO 6 DISTRICTS AND AS"
70 PRINT"MANY RACES AS MEMORY PERMITS.":PRINT
75 PRINT"IF LESS THAN 6 DISTRICTS WANTED THEN"
77 PRINT"ENTER 'DONE' AS LAST DISTRICT ENTRY":PRINT
80 GOSUB6000:PRINT:INPUT"WHICH PARTY DO YOU WISH TO STUDY";PC$
100 PRINT:GOSUB6000
110 DIMD$(6),D(6),V(20)
200 PRINT:INPUT"HOW MANY RACES TO BE STUDIED";KR
210 KR=INT(ABS(KR)):KD=1:GOSUB6000
220 PRINT:PRINT"DISTRICT CHOICE #";KD;
230 INPUTD$(KD):IFLEN(D$(KD))>10THEND$(KD)=LEFT$(D$(KD),10)
240 IFD$(KD)="DONE"THENKD=KD-1:GOTO270
250 IFKD=6THEN270
260 KD=KD+1:GOTO220
270 GOSUB6000:GOSUB6100
280 DIMC(KD,KR),K(KD,KR),R$(KR)
290 CR=1:FORK=1TOKR
300 PRINT"□";:PRINT"INSERT FILE #";K
310 GOSUB6100
320 PRINT"WORKING":OPENK
330 INPUT#K,P$:P=VAL(P$)
340 INPUT#K,D$:D=VAL(D$)
350 INPUT#K,R$
360 INPUT#K,V$
370 PRINT"LOADING:",R$,Y$:R$(CR)=Y$+R$
380 FORI=1TOP:INPUT#K,PR$
390 IFPR$=PC$THENPC=I
400 NEXTI
410 FORI=1TOD:INPUT#K,D$
420 FORJ=1TOP:INPUT#K,V$:V(J)=VAL(V$)
430 NEXTJ
440 FORJ=1TOKD
450 L=LEN(D$(J))
460 IFLEFT$(D$,L)<>D$(J)THEN510
470 V=0
480 FORJ1=1TOP:V=V+V(J1):NEXTJ1
490 VV=INT(10000*V(PC)/V)/100
500 C(J,K)=V(PC):K(J,K)=VV
510 NEXTJ
520 NEXTI
530 CLOSEK
540 CR=CR+1:NEXTK:CR=CR-1
560 PRINT"□";:GOSUB6000
570 FORI=1TOKD:PRINTD$(I):NEXTI:GOSUB6000
580 PRINT"OPTIONS"
590 PRINT"-------"
600 PRINT"1)SINGLE RACE"
610 PRINT"2)SINGLE DISTRICT"
620 PRINT"3)COMPARE RACES"
```

More →

VOTETARGET listing continued.

```
630 PRINT"4)DONE"
640 GOSUB6000
650 INPUT"WHICH OPTION";CH:CH=INT(ABS(CH))
660 IFCH<1ORCH>4THEN650
670 ONCHGOSUB1000,1200,1500,1800
680 IFE$="END"THEN9999
690 GOTO560
1000 PRINT"□":GOSUB6000
1010 FORI=1TOCR:PRINTI;")";R$(I)
1030 NEXTI:GOSUB6000
1040 INPUT"TYPE IN NUMBER OF SELECTION";RS
1050 RS=INT(ABS(RS)):IFRS<1ORRS>CRTHEN1040
1060 PRINT"□";:GOSUB6000
1070 PRINTR$(RS);TAB(17);Y$;TAB(25);PC$
1080 GOSUB6000
1090 PRINT"DISTRICT";TAB(17);"VOTE";TAB(25);"PER CENT"
1100 GOSUB6000
1110 FORI=1TOKD
1120 PRINTD$(I);:Y=C(I,RS):GOSUB3000
1123 PRINTTAB(13+W);C(I,RS);:X=K(I,RS):GOSUB3500
1127 PRINTTAB(23+W);K(I,RS)
1130 NEXTI
1140 GOSUB6000:GOSUB6100
1150 RETURN
1200 PRINT"□";:GOSUB6000
1210 FORI=1TOKD
1220 PRINTI;")";D$(I)
1230 NEXTI:GOSUB6000
1240 INPUT"TYPE IN NUMBER OF DISTRICT WANTED";DS
1250 DS=INT(ABS(DS)):IFDS<1ORDS>KDTHEN1240
1260 PRINT"□";:GOSUB6000
1270 PRINTD$(DS);TAB(17);PC$:GOSUB6000
1280 PRINT"RACE";TAB(17);"VOTE";TAB(25);"PER CENT"
1290 GOSUB6000
1300 FORI=1TOCR
1310 PRINTR$(I);:Y=C(DS,I):GOSUB3000
1312 PRINTTAB(13+W);C(DS,I);:X=K(DS,I):GOSUB3500
1316 PRINTTAB(23+W);K(DS,I)
1320 NEXTI:GOSUB6000:GOSUB6100
1330 RETURN
1500 PRINT"□";:GOSUB6000
1510 PRINT"YOU MAY DISPLAY THE RESULTS OF 3"
1515 PRINT"DISTRICTS IN DESIRED ORDER":GOSUB6000
1520 FORI=1TOKD
1530 PRINTI;")";D$(I)
1540 NEXTI:GOSUB6000
1550 PRINT:PRINT"INPUT THE NUMBERS OF 3 DISTRICTS":PRINT
1555 PRINT"IN DESIRED ORDER. IF ONLY 2 WANTED":PRINT
1556 PRINT"ENTER '0' AS THIRD CHOICE.":PRINT
1560 GOSUB6000:FORI=1TO3
1570 PRINT"CHOICE #";I;:INPUTD(I)
1580 D(I)=INT(ABS(D(I))):IFD(I)<0ORD(I)>KDTHEN1570
1585 NEXTI
1590 GOSUB6000
1595 PRINT"DO YOU WANT: 1) VOTES  OR  2) %";:INPUTZ
1600 Z=INT(ABS(Z)):IFZ<1ORZ>2THEN1595
1610 PRINT"□":GOSUB2000
1630 FORI=1TOCR:PRINTR$(I);
1640 FORJ=1TO3
1650 ONZGOSUB4000,4500
1660 NEXTJ:PRINT:NEXTI
1720 GOSUB6000:GOSUB6100
1730 RETURN
1800 E$="END":RETURN
2000 GOSUB6000
2010 PRINT"RACE";TAB(16);LEFT$(D$(D(1)),7);
2020 PRINTTAB(24);LEFT$(D$(D(2)),7);
2030 PRINTTAB(32);LEFT$(D$(D(3)),7)
2040 GOSUB6000
2050 RETURN
3000 W1=0
3010 Y=Y/10
3020 IFY<.1THEN3050
3030 W1=W1+1
3040 GOTO3010
3050 W=7-W1
3100 RETURN
3500 W=0
3510 IFX<1THENW=2:GOTO3540
3520 IFX>=1ANDX<10THENW=1:GOTO3540
3530 IFX>=10THENW=0
3540 RETURN
4000 Y=C(D(J),I):GOSUB3000
4010 GOSUB4600
4020 PRINTC(D(J),I);
4030 RETURN
4500 X=K(D(J),I):GOSUB3500
4510 GOSUB4600
4520 PRINTK(D(J),I);
4530 RETURN
4600 PRINTTAB((J+1)*8+W-3);
4610 RETURN
6000 FORI9=1TO39:PRINT"*";:NEXTI9:PRINT:RETURN
6100 Z$="":PRINT:PRINTTAB(7);"HIT ANY KEY TO CONTINUE."
6110 GETZ$:IFZ$=""THEN6110
6120 RETURN
9999 END
```

Program listing. COMPARE.

```
10 REM  COMPARE
11 REM  BY
```

More

very important in speeding up BASIC execution.

In this program, G-SORT is used to sort several lists simultaneously. Thus it may not be clear what the basic algorithm is. Here is the original G-SORT:

```
100 FORI=1 TO N-1:X=I:Y=A(I)
110 FOR J=I+1 TO N
120 IF Y>A(J) THEN 140
130 Y=A(J):X=J
140 NEXT J
150 A(X)=A(I):A(I)=Y
160 NEXT I
```

Before briefly describing the remaining programs, let me explain why I didn't put all the routines into one program using a menu. The more routines you use in a single program, the longer it takes to load the program. Since I rarely had to use more than one routine at a time, I opted for the faster loading time.

Of the remaining programs, I use VOTEPLACE most frequently. VOTEPLACE lets you step through each district and sort the district's vote, and prints out the parties in the order of their finish. When you have as many as 13 parties in 65 districts, as in the 1973 New York City mayor-

COMPARE listing continued.

```
12 REM  GARY GREENBERG
13 REM
14 REM  COMPARE UP TO 5 RACES
15 REM
100 DIMR$(5),T(67,5),W(67,5),D$(67),V(20)
105 PRINT"□"
110 GOSUB9000:PRINT
120 PRINT"COMPARE UP TO 5 RACES":PRINT
130 PRINT"WHICH PARTY DO YOU WANT":PRINT
140 GOSUB9000
150 INPUTPC$
170 Z$="Y":C=0
180 FORI=1TO5
190 IFZ$="N"THEN400
195 GOSUB9000
200 INPUT"DO YOU HAVE ANOTHER RACE TO ENTER";Z$
210 Z$=LEFT$(Z$,1)
220 IFZ$<>"Y"THEN400
222 PRINT:PRINT"ENTER DATA IN C-1":GOSUB9000:GOSUB9100
225 OPENI
230 INPUT#I,P$:P=VAL(P$)
240 INPUT#I,D$:D=VAL(D$)
250 INPUT#I,R$
260 INPUT#I,Y$:R$(I)=R$+Y$:PC=0
265 C=C+1
270 FORJ=1TOP
280 INPUT#I,P1$:IFP1$=PC$THENPC=J
290 NEXTJ:
300 FORJ=1TOD
310 INPUT#I,D$(J):PRINTD$(J)
320 V=0
330 FORK=1TOP
340 INPUT#I,V$:V(K)=VAL(V$)
350 V=V+V(K)
360 NEXTK
365 T(J,I)=V(PC)
370 W(J,I)=INT(10000*V(PC)/V)/100
380 NEXTJ
390 CLOSEI
400 NEXTI
410 GOSUB9000
420 PRINT"□";:GOSUB9000:PRINT
430 PRINT"1) RUN ALL DISTRICTS"
440 PRINT"2) CHOOSE ONE DISTRICT"
450 PRINT"3) DONE"
460 GOSUB9000
470 INPUT"ENTER COMMAND";Q$
480 IFQ$<"1"ORQ$>"3"THEN460
490 Q=VAL(Q$)
```

More →

COMPARE listing continued.

```
500 ONOGOSUB1000,1100,1300
510 IFE$="END"THEN530
520 GOTO410
530 END
1000 PRINT"□";
1010 FORI=1TOD:GOSUB9000
1020 PRINTD$(I):GOSUB9000
1030 FORJ=1TOC
1035 PRINTR$(J);:GOSUB2000
1040 PRINTTAB(20+W1);T(I,J);:GOSUB3000:PRINTTAB(30+W1);W(I,J)
1050 NEXTJ
1060 GOSUB9000:GOSUB9100
1070 NEXTI
1080 RETURN
1100 PRINT"□";:GOSUB9000
1110 INPUT"WHAT DISTRICT DO YOU WANT";DD$
1120 L=LEN(DD$)
1130 FORI=1TOD
1140 L1=LEN(D$(I))
1150 IFLEFT$(DD$,L1)<>D$(I)ANDLEFT$(D$(I),L)<>DD$THEN1205
1160 GOSUB9000
1170 PRINTD$(I):GOSUB9000
1180 FORJ=1TOC
1185 PRINTR$(J);:GOSUB2000
1190 PRINTTAB(20+W1);T(I,J);:GOSUB3000:PRINTTAB(30+W1);W(I,J)
1200 NEXTJ
1205 NEXTI
1210 GOSUB9000
1220 INPUT"DO YOU WANT ANOTHER DISTRICT";Z1$
1230 IFLEFT$(Z1$,1)="Y"THEN1110
1240 RETURN
1300 E$="END"
1310 RETURN
2000 W2=LEN(STR$(T(I,J))):W1=7-W2
2010 RETURN
3000 W2=INT(W(I,J))
3010 IFW2<1THENW1=3
3020 IFW2>=1ANDW2<10THENW1=2
3030 IFW2>=10ANDW2<100THENW1=1
3040 IFW2=100THENW1=0
3050 RETURN
9000 FORI9=1TO39:PRINT"*";:NEXTI9:PRINT:RETURN
9100 Z2$=""
9110 PRINT"HIT ANY KEY WHEN READY"
9120 GETZ2$:IFZ2$=""THEN9120
9130 RETURN
```

ol race, such a program can be extremely helpful in checking for your better districts.

VOTETARGET lets you choose six districts and one party for analysis of multiple campaigns. For example, if I want to know the voting trend for the Libertarian Party in six different districts for the last 15 races in those districts, I would use this program.

COMPARE provides a somewhat different perspective. With this program you can compare a party's results for five different campaigns for all the districts in the file.

VOTEEDIT lets you step through your file and edit the data. You need a second cassette to use this program. Since getting the new model PET, I have found that I can use the Connecticut Microcomputer Word Processor Program to do my file editing. However, it is necessary that the file fit into memory on top of the word processor.

This, then, is the Election Analysis System for the 8K PET. It demonstrates the power of the computer even without a printer and disks. Even better, when your friends ask

↙See List of Advertisers on page 242

what the computer does, you can now easily demonstrate the beauty of the machine.

There are many other access programs that can be designed. Statistical analysis of significance suggests itself right away. The important thing to remember is the file format. Studying the various programs here should make the format clear. ■

Program listing. VOTEEDIT.

```
10 REM  VOTEEDIT
11 REM  BY
12 REM  GARY GREENBERG
13 REM
14 REM  CORRECT VOTE DATA
15 REM
100 PRINT"□":PRINT:PRINT:PRINT:GOSUB9000
110 PRINT:PRINTTAB(10);"CORRECT VOTE DATA"
120 PRINT:PRINTTAB(10);"COPYRIGHT 1980 BY"
130 PRINT:PRINTTAB(11);"GARY  GREENBERG"
140 PRINT:GOSUB9000
150 PRINT:GOSUB9200
200 PRINT"□":GOSUB9000
210 PRINT:PRINT"TO CORRECT DATA PUT DATA TAPE IN C-2."
220 PRINT:GOSUB9000:PRINT:GOSUB9200:PRINT:GOSUB9000
230 OPEN1,2:PRINT"□":GOSUB9000
240 PRINT:INPUT#1,P$:PRINTP$;" PARTIES"
250 PRINT:INPUT#1,D$:PRINTD$;"DISTRICTS"
260 PRINT:INPUT#1,R$:PRINTR$
270 PRINT:INPUT#1,Y$:PRINTY$
280 PRINT:GOSUB9000
290 PRINT:INPUT"IS ABOVE DATA CORRECT";Z$
300 IFLEFT$(Z$,1)="Y"THEN400
310 PRINT:GOSUB9000:PRINT:INPUT"HOW MANY PARTIES";P$
320 PRINT:INPUT"HOW MANY DISTRICTS";D$
330 PRINT:INPUT"RACE NAME";R$
340 PRINT:INPUT"WHAT YEAR";YY$:Y$=RIGHT$(YY$,2)
350 GOTO280
400 P=VAL(P$)
410 D=VAL(D$)
420 DIMA$(D),B(P),P$(P)
425 PRINT"□";:GOSUB9000:PRINT
430 FORI=1TOP:INPUT#1,P$(I):PRINTI;")";TAB(5)P$(I):NEXTI
440 PRINT:GOSUB9000
470 PRINT:INPUT"ARE ABOVE PARTIES CORRECT AND IN ORDER";Z$
480 IFLEFT$(Z$,1)="Y"THEN590
490 PRINT:GOSUB9000:FORI=1TOP:PRINT"ENTER PARTY #";I;
500 INPUTP$(I):PRINT:NEXTI
510 GOTO470
590 PRINT"□":GOSUB9000
730 PRINT:PRINT"PUT BLANK TAPE IN C-1."
740 PRINT:GOSUB9000:PRINT:GOSUB9200
750 F$=R$+Y$
755 POKE243,122:POKE244,2
760 OPEN2,1,1,F$
770 PRINT#2,P$:T$=P$:GOSUB5000:PRINTT$;
780 PRINT#2,D$:T$=D$:GOSUB5000:PRINTT$;
790 PRINT#2,R$:T$=R$:GOSUB5000:PRINTT$;
800 PRINT#2,Y$:T$=Y$:GOSUB5000:PRINTT$;
810 FORI=1TOP
820 PRINT#2,P$(I):T$=P$(I):GOSUB5000:PRINTT$;
1000 FORI=1TOD:K=I:INPUT#1,A$(K)
1020 FORJ=1TOP:INPUT#1,B(J):NEXTJ
1030 GOSUB1500
1050 PRINT#2,A$(I):T$=A$(K):GOSUB5000:PRINTT$;
1060 FORJ=1TOP
1070 V$=STR$(B(J))
1080 PRINT#2,V$:T$=V$:GOSUB5000:PRINTT$;
1090 NEXTJ
1120 NEXTI
1130 CLOSE1
1140 CLOSE2
1200 PRINT"DONE"
1210 END
1500 PRINT"□":GOSUB9000:PRINT
1510 PRINT" 1 ) ";TAB(6);A$(K);TAB(15);"DISTRICT":PRINT
1520 FORJ=1TOP
1530 PRINTJ+1;")";TAB(5);B(J);TAB(15);P$(J)
1540 NEXTJ:PRINT
1550 PRINTP+2;")";TAB(6);"DATA NOW CORRECT":PRINT
1560 GOSUB9000:PRINT
1570 INPUT"WHAT NUMBER LINE WANTED";N$
1575 PRINT:GOSUB9000:PRINT
1580 N=VAL(N$):IFN<10RN>P+2THEN1560
1590 IFN=1THENINPUT"WHAT IS DISTRICT NAME";DN$:A$(K)=LEFT$(DN$,10):GOTO1500
1600 IFN=P+2THEN1640
1610 PRINT"VOTE FOR ";P$(N-1);" IS";
1620 INPUTB(N-1)
1630 GOTO1500
1640 RETURN
5000 REM CHECK BUFFER FULL
5010 SZ=SZ+LEN(T$)+1
5020 IFSZ<192GOTO5100
5030 POKE59411,53
5040 T=TI
5050 IF(TI-T)<6GOTO5050
5060 POKE59411,61
5070 SZ=SZ-191
5100 RETURN
9000 FORI9=1TO39:PRINT"※";:NEXTI9:PRINT:RETURN
9200 PRINTTAB(7);"HIT ANY KEY TO CONTINUE"
9210 Z9$=""
9220 GETZ9$:IFZ9$=""THEN9220
9230 RETURN
```

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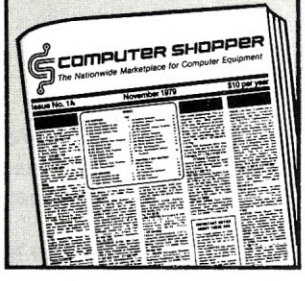

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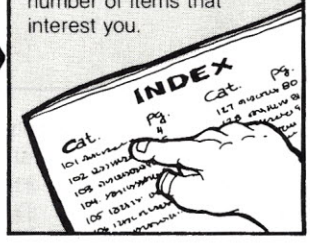

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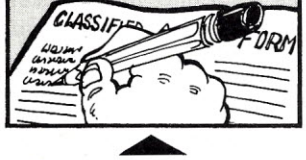

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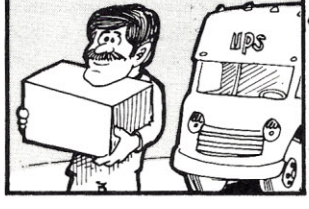

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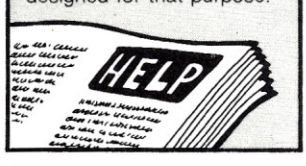

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Now, through a simple question and answer session, you can implement file inquiries interactively, without writing or modifying a single line of code. In North Star BASIC.

A Time-Saver For Your Database

By John E. Bailey

While developing a database system for my North Star computer, it occurred to me that it would be nice to be able to build database inquiries interactively. Since I wanted to display the database records on my CRT, then the CRT was the logical place to design the format of the display. This led me to develop an interactive mapping/inquiry facility (IMF). It didn't take long for me to realize that this facility would be a great time-saver in developing inquiries, in addition to being a very impressive addition to my database system.

After working with the system for a while, I realized that the ideas that went into IMF were general enough in nature that they could be adapted to any file, whether it was created by a database system or not. They can be used as a block upon which to build.

Just what is an interactive mapping/inquiry facility? I'd define it as a method of designing file inquiries interactively and implementing those inquiries through a simple question-and-answer session with the computer. Displaying various records under different screen layouts should be done without writing or modifying a single line of code.

Two programs are presented here. The first, IMF, lets you design a screen interactively on the CRT. The other, INQY, is a simple inquiry program that retrieves and displays records according to the screen layout developed in IMF.

Address correspondence to John E. Bailey, 24 Hibiscus St., Sulphur, LA 70663.

Label	Start	Stop
Part no.	1	10
Description	11	30
Quantity on hand	31	33
Price	34	40
Vendor	41	60

Table 1. Sample inventory records.

About the Datafile

The file must consist of fixed-length records. Each record must be a single alphanumeric string whose separate fields are substrings. The records must have a fixed-length key that must be in the same location in each record.

The file can be created and maintained any way you choose—by a database system, a text editor, a dedicated file maintenance program or whatever. It is important that you know the total length of each record, the location of the record key and the start and stop position of each field (substring) in the record.

Let's take an example and see how the programs work. Suppose we have an inventory file whose records are defined as shown in Table 1. We want to retrieve the records and display them on the screen in the format shown in Fig. 1.

You might think at this point that it would be simple to write a program to retrieve records from your parts file and display them in the format shown, and I agree that it would be. But, suppose you had several different files and several different screen layouts for each file. Then you would have to write a different program for each file and each screen layout. That's where an interactive mapping/inquiry facility comes in handy.

Let me re-emphasize that the two programs presented here are general in nature. Although very usable in the form presented, they are intended to illustrate interactive mapping and inquiry.

Load IMF and run it. You will receive the following prompt:

```
ENTER NAME OF MAP FILE (<= 7
CHARACTERS)?
```

Enter the name of a file to contain the maps. IMF appends an I to the file name for the input map and an O for

```
                ***  PARTS INQUIRY  ***
================================================
PART NUMBER      : XXXXXXXXXX
DESCRIPTION      : XXXXXXXXXXXXXXXXXXXX
------------------------------------------------
QUANTITY ON HAND    : XXX
           PRICE    : $XXXX.XX
          VENDOR    : XXXXXXXXXXXXXXXXXXXX
================================================
```

Fig. 1. Sample inventory display.

the output map. The input map file will contain the screen information exactly as you key it in on the screen. The output map will contain a coded map to be used by the INQY program.

The menu screen shown in Fig. 2 will appear next. Select 1 to build the screen. If you are defining a new map, the program will create the input and output map files for you.

Review the instructions received on the screen and press return. The screen will be cleared and you can then begin defining the map. Key in one line at a time. Press return at the end of each line. Use the space bar to move the cursor right, the backspace (rubout) key to move it left. Use the return key to move the cursor down one line. If you have a text editor, you may want to use it to define the screen, since IMF does not provide any editing capabilities. If you make a mistake, you must start over from the beginning.

Key in the map shown in Fig. 3. Key in a + sign in each location on the screen where a variable field is to be displayed. Although the example doesn't illustrate it, more than one variable can be coded on a single line. When you are through, type /END to end the screen definition.

Next, you must tell the program where each variable represented by a + is located in the data record. After a short pause, some more directions will appear on the screen. Press return to begin the variable definition. First you must tell the program where the key is located in the record. Next, the map will begin to be displayed on the screen. Each time a + is encountered, the following prompts appear:

```
CURSOR POSITION IS XXX
ENTER START POSITION IN RECORD ?
ENTER STOP POSITION IN RECORD ?
```

The current position of the cursor is displayed; i.e., the absolute location on the screen where the current variable will be displayed. Enter the start and stop positions in the record for the variable that you want displayed at the current cursor location. You must fill in this information for each variable on the screen represented by a +. After all variables are defined, control is returned to the menu.

As mentioned earlier, a text editor may be used to create the input map. If so, the map name must be eight characters or less, and the last character must be an I. You will also need to create the output map file, whose name is the same as the input map except the last character is 0. Select 2 from the menu and control will be passed directly to the variable definition phase. Output will go to the output map file already created.

About the Output Map

The output map contains all of the information necessary for the INQY program to retrieve and display the

```
                INTERACTIVE MAPPING FACILITY

          SELECT YOUR OPTION FROM THE LIST BELOW:

                1 - BUILD THE SCREEN
                2 - DEFINE THE VARIABLES
                3 - STOP


                          ENTER YOUR SELECTION ?
```

Fig. 2. IMF menu screen.

```
                    ***  PARTS INQUIRY  ***
================================================
PART NUMBER      : +
DESCRIPTION      : +
------------------------------------------------
QUANTITY ON HAND      : +
          PRICE       : $+
         VENDOR       : +
================================================
```

Fig. 3.

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Listing 1. IMF program in North Star BASIC.

```
10 REM  *****
20 REM  *
30 REM  *        INTERACTIVE MAPPING FACILITY
40 REM  *
50 REM  *        CODED BY JOHN E. BAILEY
60 REM  *             JULY, 1983
70 REM  *
80 REM  *        PROGRAM NAME IS -- "IMF"
90 REM  *
100 REM *****
110 DIM L$(80),S(20),P(20),M$(1920)
120 C9$=CHR$(27)+CHR$(69)
130 !C9$
140 !\!\INPUT "     ENTER NAME OF MAP FILE ( <= 7 CHARACTERS ) ? ",S$
150 IF LEN(S$)>7 THEN 140
160 I$=S$+"I"
170 O$=S$+"O"
180 !C9$
190 !\!\!
200 !"                    INTERACTIVE MAPPING FACILITY"
210 !
220 !"               SELECT YOUR OPTION FROM THE LIST BELOW:"
230 !
240 !"                     1 - BUILD THE SCREEN"
250 !"                     2 - DEFINE THE VARIABLES"
260 !"                     3 - STOP"
270 !\!\!
280 INPUT "                          ENTER YOUR SELECTION ? ",Z
290 IF Z>2 THEN STOP
300 ON Z GOTO 310,580
310 !C9$
320 !"     IF THIS IS A NEW SCREEN AND YOU WANT TO CREATE THE"
330 !"     MAP FILES, KEY IN 'NEW'.  OTHERWISE, PRESS RETURN ? ",
340 INPUT "",Z$
350 IF Z$<>"NEW" THEN 390
360 CREATE I$,6
370 CREATE O$,6
380 !C9$
390 !"     BEGIN SCREEN DEFINITION PHASE."
400 !\!"       THIS FUNCTION PROVIDES A BASIC METHOD OF DESIGNING THE"
410 !"     SCREEN ONLINE.  YOU SHOULD VERY CAREFULLY LAY OUT THE"
420 !"     SCREEN ON A SHEET OF PAPER BEFORE ENTERING THE SCREEN"
430 !"     VIA THE KEYBOARD.  NO EDITING CAPABILITIES ARE PROVIDED"
440 !"     OTHER THAN SINGLE LINE EDITING PROVIDED BY THE BACK SPACE"
450 !"     KEY.  IF YOU SHOULD MAKE A MISTAKE, YOU WILL HAVE TO"
460 !"     KEY IN THE WHOLE MAP AGAIN."
470 !\!"       ENTER /END TO END THE SCREEN DEFINITION PHASE.",
480 !
490 OPEN #1,I$
500 !\!\!
510 INPUT "     PRESS RETURN AND BEGIN SCREEN DEFINITION.....",Z$
520 !C9$
530 INPUT "",L$
540 IF L$="/END" THEN 570
550 WRITE #1,L$
560 GOTO 530
570 CLOSE #1
580 REM  **********
590 REM  *    READ IN INPUT MAP AND BUILD M$
600 REM  **********
610 !C9$
620 !"     BEGIN VARIABLE DEFINITION PHASE."
630 !\!"        *****  PLEASE WAIT  *****"
640 OPEN #1,I$
650 OPEN #2,O$
660 M$=""
670 IF TYP(1)=0 THEN 710
680 READ #1,L$
690 M$=M$+L$+CHR$(13)+CHR$(10)
700 GOTO 670
710 M=LEN(M$)
720 FOR I=1 TO M
730 IF M$(I,I)="+" THEN M$(I,I)=" "
740 NEXT
750 WRITE #2,M,M$
760 !\!"       EACH VARIABLE WILL NOW BE DISPLAYED."
770 !"     IT IS PRECEEDED BY A  '+'  .  THE CURRENT"
780 !"     CURSOR LOCATION WILL BE DISPLAYED.  YOU"
790 !"     WILL BE ASKED TO PROVIDE THE START AND STOP"
800 !"     POSITION OF THE FIELD IN THE RECORD TO BE"
810 !"     DISPLAYTED AT THE  '+'  ."
820 !
830 INPUT "     PRESS RETURN TO BEGIN VARIABLE DEFINITION.",Z$
840 REM  **********
850 REM  *    BEGIN VARIABLE DEFINITION PHASE
860 REM  **********
870 !C9$
880 INPUT "     ENTER THE STARTING POSITION OF THE RECORD KEY ? ",K0
890 !
900 C=0
910 READ #1 %0,L$
920 GOTO 950
930 IF TYP(1)=0 THEN 1200
940 READ #1,L$
950 L=LEN(L$)
960 FOR I=1 TO L
```

More →

Listing 1 continued.

```
970 !L$(I,I),
980 IF L$(I,I)="+" THEN GOSUB 1030
990 NEXT
1000 C=C+80
1010 !""
1020 GOTO 930
1030 REM  *****
1040 REM  *   THIS SUBROUTINE COMPUTES THE CURRENT
1050 REM  *   CURSOR ADDRESS AND LOCATES THE VARIABLE
1060 REM  *   IN THE DATAFILE RECORD.
1070 REM  *****
1080 !""
1090 !
1100 C1=C+I-1
1110 A$="                "
1120 !"     CURSOR POSITION IS",C1
1130 !
1140 INPUT "     ENTER START POSITION IN RECORD ? ",S
1150 INPUT "     ENTER STOP  POSITION IN RECORD ? ",P
1160 !
1170 IF S=K0 THEN C1=-C1
1180 WRITE #2,C1,S,P
1190 RETURN
1200 CLOSE #1
1210 CLOSE #2
1220 GOTO 180
1230 END
```

data. Fig. 4 shows the layout of this file. M is the length of M$. M$ is a single-string variable containing the input map with the + signs removed. Each variable is represented by three fields. The first field is the cursor location at which the variable is to be displayed. The next two fields define the start and stop positions of the variable in the data record. Each variable is defined this way. The cursor location for the key variable is negative. This tells the INQY program where to position the cursor initially.

Using the INQY Program

"INQY" is a general-purpose inquiry program that retrieves any record meeting the previously stated criteria and displays it on the screen according to the map defined by IMF. Load INQY and run it. Enter the name of the datafile you want to inquire and the seven-character map name to display it by. The program enters an initialization phase at which time the output map is read into memory. The map will then appear on the screen. The + signs will be missing. The cursor will be positioned on the screen at the location where the key variable is to be displayed.

Type in the key for the record you wish to retrieve. You may type in the entire key or any number of leading characters of the key. The program will search the datafile for all records whose key begins with the characters typed in. When a record is found, each variable field will be displayed in its corresponding location on the screen. The cursor will return to its initial position. You may then type in a new key or simply press return to continue searching the datafile for the current key.

INQY does a sequential search of the datafile. Each time a record is found, the program refers to the output map definition to determine where the respective variables are in

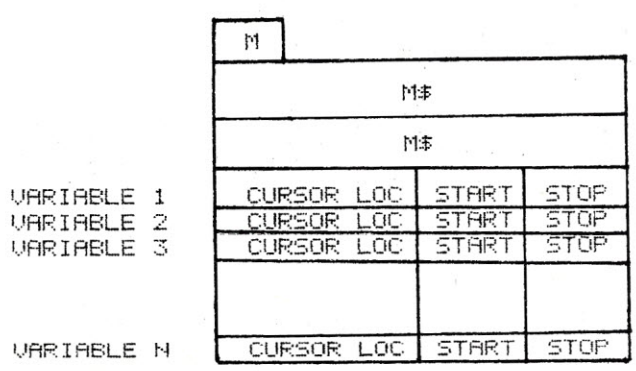


Fig. 4. Layout of output map file.

Call for Manuscripts

You don't have to be a professional writer to submit manuscripts to **Kilobaud Microcomputing**. In fact, our material comes almost exclusively from you–the reader.

Here are some suggested article topics:

- **Business.** Applications–how businesses can make use of micros, what programs and systems are particularly well-suited to business use. Profiles–of businesses that are using micros, and profiles of businesses that are part of the micro industry.
- **Education.** Applications for learning both in the home and at school. Also, your school's experiences with computer use in the classroom.
- **Home applications.** Computerists are always looking for new ways to use their computers in the home. What is your computer doing to make life easier for you?
- **Software.** We're always on the lookout for new programs, in virtually all areas–business, education, science, personal management and so on. Even short subroutines that will improve someone else's program have their place.
- **Scientific, medical applications.**
- **Programming techniques.**
- **Tutorials.** Practical information on specific topics, usually geared toward the beginner.

Send your manuscripts or article ideas to: Kilobaud Microcomputing, Pine St., Peterborough, NH 03458.

✓See List of Advertisers on page 242

the record and where they are to be displayed on the screen.

About the Programs

The programs are written in North Star BASIC and are designed to run with the Heath H19 terminal. The programs should be easily convertible to other BASICs and other terminals. The following notes should help. In both programs, C9$ is a char-

Listing 2. INQY program.

```
10 REM  *****
20 REM  *
30 REM  *     ONLINE INQUIRY PROGRAM
40 REM  *
50 REM  *     CODED BY JOHN E. BAILEY
60 REM  *         AUGUST, 1980
70 REM  *
80 REM  *     PROGRAM NAME IS - "INQY"
90 REM  *
100 REM *****
110 C9$=CHR$(27)+CHR$(69)
120 DIM C(20),S(20),P(20),E$(300)
130 !C9$
140 INPUT "      ENTER NAME OF DATAFILE TO INQUIRE ? ",D$
150 !\INPUT "      ENTER NAME OF MAP FILE ( <= 7 CHARACTERS ) ? ",S$
160 S$=S$+"0"
170 !\!"      *****  INITIALIZATION IN PROGRESS  *****"
180 REM  *****
190 REM  *   READ SCREEN DEFINITION INTO MEMORY
200 REM  *****
210 OPEN #1,S$
220 OPEN #2,D$
230 READ #1,M
240 DIM M$(M)
250 READ #1,M$
260 I=1
270 IF TYP(1)=0 THEN 350
280 READ #1,C(I),S(I),P(I)
290 IF C(I)>=0 THEN 330
300 C(I)=-C(I)
310 C1=C(I)
320 K0=S(I)
330 I=I+1
340 GOTO 270
350 T=I-1
360 CLOSE #1
370 !C9$
380 !M$
390 C=C1
400 GOSUB 750
410 REM  *****
420 REM  *   RETRIEVE A RECORD FROM THE DATAFILE
430 REM  *****
440 INPUT1 "",K$
450 IF K$="END" THEN STOP
460 K=LEN(K$)
470 K1=K0+K-1
480 READ #2 %0,E$
490 GOTO 520
500 IF TYP(2)=0 THEN 670
510 READ #2,E$
520 IF E$(K0,K1)<>K$ THEN 500
530 REM  *****
540 REM  *  DISPLAY THE RECORD
550 REM  *****
560 FOR I=1 TO T
570 C=C(I)\S=S(I)\P=P(I)
580 GOSUB 750
590 !E$(S,P)
600 NEXT
610 C=C1
620 GOSUB 750
630 INPUT1 "",K1$
640 IF K1$="" THEN 500
650 K$=K1$
660 GOTO 450
670 REM  *****
680 REM  *  END OF FILE ROUTINE
690 REM  *****
700 C=1780
710 GOSUB 790
720 !"END OF FILE REACHED.....",CHR$(7),
730 INPUT "",Z$
740 GOTO 370
750 REM  *****
760 REM  *  THIS ROUTINE POSITIONS THE CURSOR
770 REM  *  AT THE APPROPRIATE POSITION.
780 REM  *****
790 Y=INT(C/80)
800 X=C-Y*80+1
810 Y=Y+2
820 !CHR$(27),CHR$(89),CHR$(31+Y),CHR$(31+X),
830 RETURN
840 END
```

acter string variable containing the clear screen characters for the terminal. String variables are handled a little differently in North Star BASIC than in other BASICs.

For example, DIM M$(1920) means to reserve 1920 characters of memory for the string variable M$. M$(I,J) is equivalent to MID$(M$,I, J−I+1). The TYP(N) function is used to detect end of file where N is the file number. Line 910 of IMF is used to reposition file 1 at its beginning as line 480 in INQY repositions file 2.

Your terminal must have direct cursor addressing capability. Line 820 of INQY contains the control characters used to position the cursor at line Y, column X. You may need to change this line for your terminal. The programs limit the number of screen variables to 20. This may be changed by changing the dimension sizes of C, S and P. The maximum record length is 255.

Conclusion

Being able to design inquiries interactively without having to actually write programs can be a great time-saver in many instances. The programs given here provide this capability in a very basic form. The concepts presented can be expanded upon to provide some very impressive as well as time-saving and useful capabilities. I have integrated these concepts to a higher degree into my own database system. Even so, I feel that I have only begun to realize the possibilities of interactive mapping and inquiry.■

```
10 REM  *****
20 REM  *  BUILD 'TSTFILE'
30 REM  *****
40 DIM R$(60)
50 CREATE "TSTFILE",6
60 OPEN #1,"TSTFILE"
70 FOR I=1 TO 10
80 READ R$
90 WRITE #1,R$
100 NEXT
110 STOP
120 DATA "IC7400    QUAD GATE            4  0.25   ABC ELECTRONICS     "
130 DATA "RS220K    220K RESISTOR        12 0.15   XYZ RADIO           "
140 DATA "CP.001MF  .001 MF CAPACITOR    5  0.35   ZZZ ELECTRONICS     "
150 DATA "CP.22MF   .22 MF CAPACITOR     2  0.35   ZZZ ELECTRONICS     "
160 DATA "IC7404    QUAD GATE            3  0.55   ABC ELECTRONICS     "
170 DATA "IC6800    MICROPROCESSOR       1  12.50  MOTOROLA            "
180 DATA "RS147K    147K RESISTOR        9  0.15   XYZ RADIO           "
190 DATA "RS100K    100K RESISTOR        18 0.09   WHOLESALE PARTS     "
200 DATA "DI1N14    1N14 DIODE           7  0.05   WHOLESALE PARTS     "
210 DATA "CP22MF    22 MF ELECTROLYTIC   3  0.45   XYZ RADIO           "
220 END
```

Listing 3. Program to verify the operation of IMF and INQY. It builds a test file containing ten records as defined in the example data file.

✓See List of Advertisers on page 242

Here's a neat little subroutine that adds versatility to your North Star editing capability.

Editing Enhancer

By Lon W. Dean

Computers can perform myriad tasks, but the majority of available software is dedicated to a single function. Text editors edit text, inventory programs maintain inventory, payroll programs perform payroll. But why not edit text within the inventory or payroll programs?

Traditionally, with the exception of text editing or word processing programs, business application programs' only editing functions are the reentering of a string and the liberal use of the backspace during input. Thus, when you run your favorite mail list program and discover a typographical or spelling error, you normally have to reenter the entire name or address string to correct it. The programming necessary to allow more convenient editing features is usually deemed too lengthy or bothersome to implement.

This is true for most computers, but a short subroutine allows extensive editing functions using North Star BASIC.

If you have studied the North Star System Software Manual well, you are aware that the BASIC line editing functions may also be used during the execution of an input statement. Therefore, if you discover a typographical or spelling error before hitting the carriage return, you first type "@" or control-N to cancel the current line and start afresh on a new line. Then you use the North Star editing functions:

- Control-A to copy one character of previous string.
- Control-G to copy entire previous string.
- Control-Z to erase one character of previous string.
- Control-D, character, to copy previous string up to the specified character.
- Control-Y, string, control-Y, to insert a character or string.
- Backspace, underline, or control-Q to back up.

Last you type a carriage return to end the input as normal.

This is convenient, but what if you have discovered the typographical error *after* hitting the carriage return, or what if you desire to alter existing string data? The North Star editing routines are still available with a little manipulation.

Listing 1 is a short program that demonstrates how a string may be edited after it is input. North Star's editing functions operate on the contents of a buffer. By poking (or filling) the string data into this buffer, you have access to the editing functions on the string data of your choice.

To use the subroutine in your programs, reserve a string variable such as E$ for use in the subroutine, making sure it is dimensioned for your line length. Set this variable equal to the string you desire to edit. Next, invoke the subroutine which pokes (or fills) the string into the buffer area (the start address for your release of BASIC may be found using the program in Listing 2), adding a carriage return, CHR$(13), which is the marker used by BASIC to signify the end of the string. Returning from the subroutine, input the desired variable (use INPUT"" to eliminate the question mark).

This subroutine is easily adapted to existing North Star BASIC software, and can be incorporated into new software. Depending on the use, it may save a tremendous amount of fingerwear and time. A powerful text editor is an obvious application. Integrating your BASIC or machine-language programs with existing system software often saves many hours of programming development and adds utility. ■

Lon W. Dean, R.D. 1, Box 72A, Whitney Point, NY 13862.

```
1000 REM ************************************************
1010 REM *       N O R T H   S T A R   E D I T   D E M O  *
1020 REM *       By  Lon W. Dean            August 1980   *
1030 REM *           R.D. 1  Box 72A                       *
1040 REM *           Whitney Point, NY  13862              *
1050 REM *                                                 *
1060 REM *       Written in North Star Basic - Release 5   *
1070 REM ************************************************
1080 DIM A$(80),E$(80)
1090 ! "ENTER THE INITIAL STRING"
1100 INPUT "",A$
1110 E$=A$
1120 GOSUB 9000
1130 ! "EDIT THE STRING"
1140 ! "(use North Star Basic's editing function)"
1150 ! "ORIGINAL:"
1160 ! A$
1170 INPUT "",A$
1180 ! \ ! "EDITED STRING:"
1190 ! A$
1200 END
8999 REM ****  SUBROUTINE TO INSERT STRING IN BUFFER ****
9000 E$=E$+CHR$(13)
9010 FOR J=0 TO LEN(E$)-1
9020      FILL(22995+J),ASC(E$(J+1,J+1))
9030 NEXT J
9040 RETURN
```

Listing 1.

```
100 REM ************************************************
110 REM *       PROGRAM TO FIND NORTH STAR BASIC'S BUFFER *
120 REM *       By Lon W. Dean              August 1980   *
130 REM *                                                 *
140 REM *       Written in North Star Basic - Release 5   *
150 REM ************************************************
160 INPUT"TYPE IN 'ZZZZ' ",A$
170 IF A$(1,4) <> "ZZZZ" THEN 160
180 ! "THIS MAY TAKE SEVERAL MINUTES - PLEASE BE PATIENT."
190 FOR M=11520 TO 23808 \ REM THIS IS FOR BASIC START AT 2D00H
200      IF CHR$(EXAM(M)) <> A$(1,1) THEN 230
210      T$=CHR$(EXAM(M))+CHR$(EXAM(M+1))+CHR$(EXAM(M+2))+CHR$(EXAM(M+3))
220      IF T$(1,4)=A$(1,4) THEN EXIT 250
230 NEXT M
240 STOP
250 ! "BASIC BUFFER STARTS AT ADDRESS",M
260 END
```

Listing 2.

↙See List of Advertisers on page 242

Sometimes micros do do it better, as in the San Juan BOCS, where OSI units have replaced a mainframe system to handle the school's educational applications.

Microcomputing in an Educational Cooperative

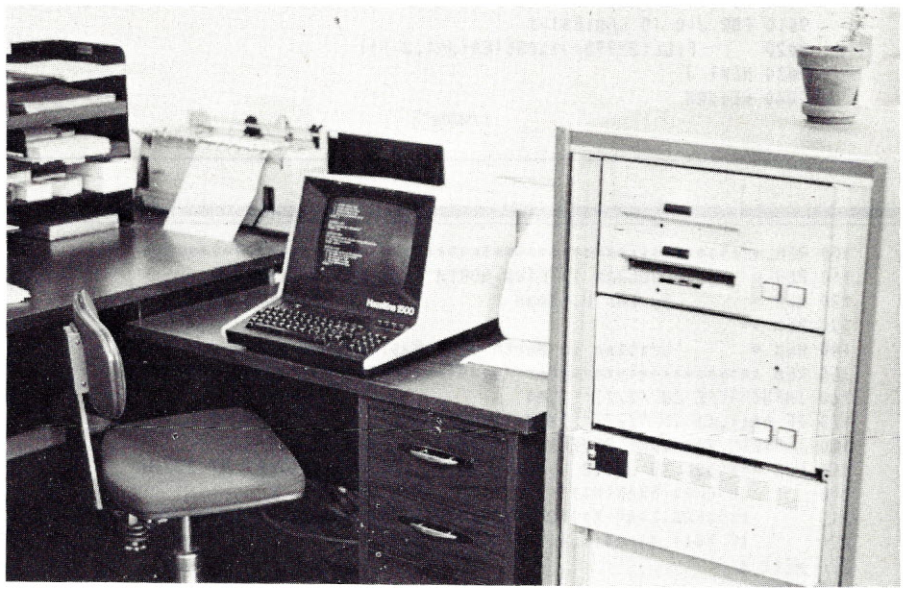
By R. W. Brown

About ten years ago, the San Juan Board of Cooperative Services began to use computers to help process the masses of data modern educational techniques produce.

At first, we used, on a batch basis, an IBM mainframe at a local college, and later a Xerox mainframe at a university in Arizona. But we ran into problems. While we developed and used several promising programs, the turnaround time was slow and highly unpredictable. Manual procedures, though reliable and somewhat faster, were impossible to maintain.

Then microcomputers began to appear. Initially, their limited file storage made them unsuitable for our needs—even then, our databases were in excess of 20 million characters. But in 1979, we found out about Ohio Scientific's C3B, a unit equipped with a 74-megabyte Winchester disk. It seemed both ideal and affordable.

The experience has been gratifying. We are now running a variety of innovative educational applications in-house, at least as successfully as we could with the mainframes and exponentially better than through remote batching. These applications are in such areas as testing, curriculum development, planning and management and records keeping.



The system: Ohio Scientific's C3B, Hazeltine 1500 terminals and Texas Instruments and NEC Spinwriter printers.

Testing

The test system could have a broad and radical impact on educational programs.

From junior and senior high schools in 14 states, we collected boxes and boxes of tests used to evaluate student learning in the classroom. From this material, we developed what we believe to be the largest and most comprehensive test item database in existence for secondary schools. The bank has over 51,000 objective items, in multiple-choice, true-false and short-answer formats.

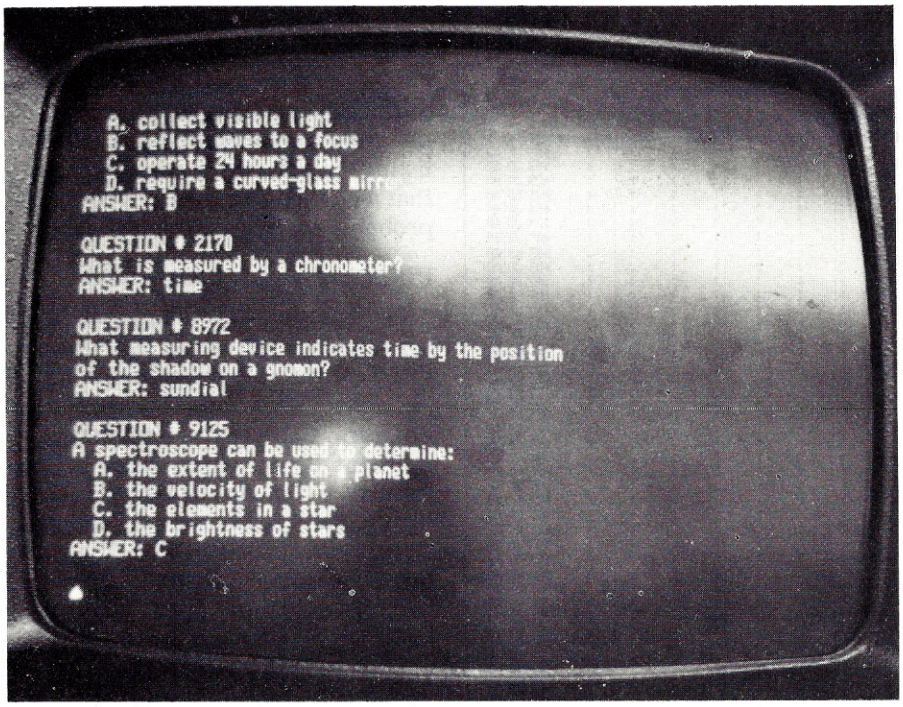
The items have been categorized by the Library of Congress system.

Test-Ease category report.

CATEGORY	DESCRIPTION	AMOUNT
QB15	ASTRONOMY HISTORY	85
QB28	SPACE PROGRAMS	47
QB51	ASTRONOMY CAREERS	1
QB55	ASTRO. MYTHS/LEGENDS/SUPERSTITIONS	12
QB81	OBSERVATORIES	2
QB85	ASTRONOMICAL INSTRUMENTS/TOOLS	20
QB88	TELESCOPES	16
QB201	ASTRONOMICAL MEASURES	79
QB209	TIME	35
QB225	LONGITUDE/LATITUDE	35
QB281	GEODESY	27
QB331	GRAVITY	22
QB343	ARTIFICIAL SATELLITES	11
QB350	ASTRONOMICAL THEORIES, LAWS	25
QB377	ASTEROIDS	15
QB500	UNIVERSE	70

More →

R. W. Brown is the executive director of San Juan BOCS, 201 12th St., Durango, CO 81301.



Test questions and answers displayed on the screen.

We are using about 1100 categories, but can include more as the needs of future users dictate.

The item base was easy to build at first. But as the number increased, it became more difficult to find quality items that didn't duplicate those already in the system. In order to get the current number of items into the bank, over 200,000 items were reviewed and edited.

The item bank is accessible in several ways. For test construction, a user can call for a certain number of items to be randomly selected in one or multiple categories, or, by reviewing listings of items in desired categories, can preselect the items. Tests are produced in an 8 1/2 × 11-inch camera-ready format, complete with an answer key. Typically, a 50-item exam needs about a minute for the test parameters to be entered and 20 minutes to process and print.

A second application is simply all questions in a category. These are used by instructors as resource materials to help ensure the comprehensiveness of lesson plans. They are also used by students for on-task practice prior to taking an actual test in the classroom. Even where teachers are using tests not generated through the system, chances are that much of the material covered by any particular teacher-made test is already in the test bank in a similar form.

A third use, and certainly the most interesting one for students, involves interacting with the database for study and recreation. Students call for a category and however many items they want. Then, the CRT displays individual questions to be answered on the keyboard. The system either confirms the student's answer or supplies the correct response. At the end of each routine, the screen shows the percent correct. Students can also ask for questions they missed and try again.

A general goal of the test system is to provide the technology through which students will be able to challenge parts of or entire courses, regardless of age, ability or ethnic background, and get credit by using the test system as a standard. There is every reason to believe that motivated students do not necessarily need 12 years to complete school. But even if this kind of long-range goal is never attained, the uses of the system within existing educational practices are just beginning to emerge.

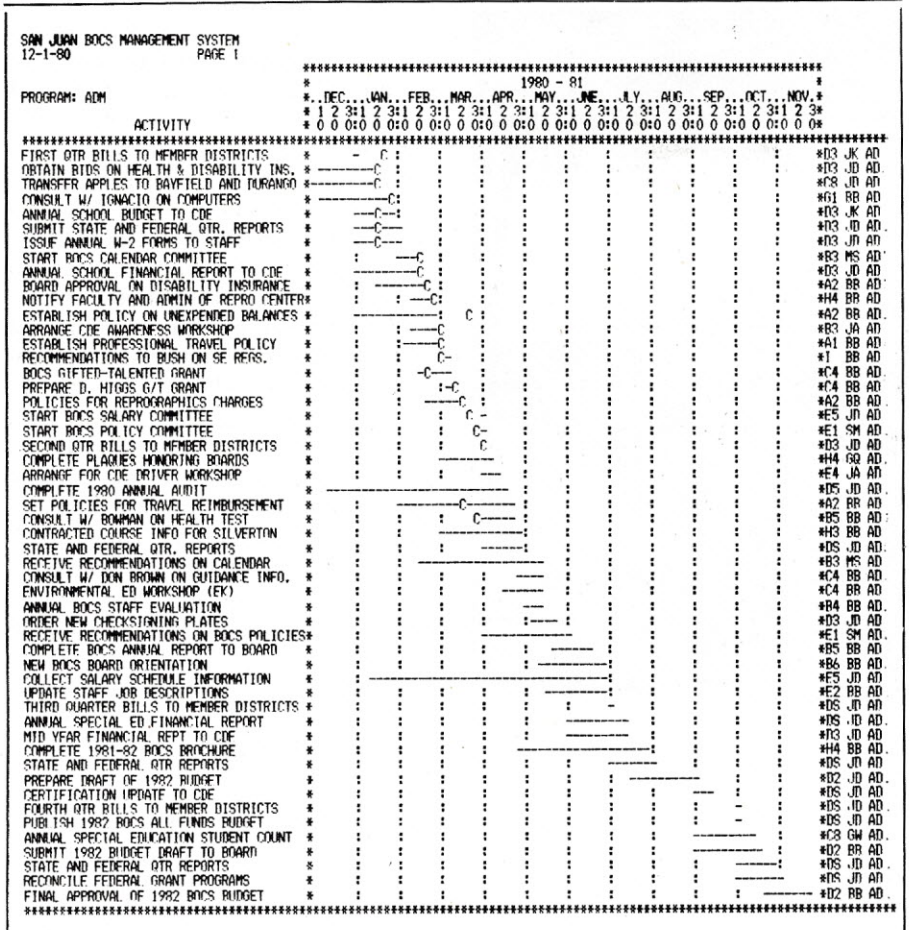
Curriculum

School accountability regulations typically require that instructional outlines state what students are expected to do at the end of instructional units. But even without these laws, faculty and administrators need this information for lesson and program planning.

The problem is that a typical grade

Report continued.

QB501	SOLAR SYSTEM	237
QB520	SUN	57
QB541	ECLIPSES	23
QB581	MOON	69
QB595	PLANETS	126
QB631	EARTH	87
QB721	COMETS	14
QB741	METEORS & METEORITES	14
QB801	STARS	69
QB803	ZODIAC/CONSTELLATIONS	27
QB851	NEBULAE	5
QB852	GALAXIES	24
QB871	STELLAR SPECTROSCOPY	26
	DISCIPLINE TOTAL=	1280
QC7	PHYSICS HISTORY	125
QC39	MEASUREMENT IN PHYSICS	122
QC53	INSTRUMENTS & APPARATUS	33
QC68	INERTIA	13
QC69	VELOCITY	14
QC70	MOMENTUM	19
QC71	FRICTION	7
QC72	ACCELERATION	56
QC73	FORCE	64
QC74	ENERGY	65
QC75	PHYSICS PRINCIPLES/THEORIES & LAWS	55
QC76	MACHINES	94
QC91	METRIC SYSTEM	118
QC106	MASS & WEIGHT	32
QC111	DENSITY/SPECIFIC GRAVITY	32
QC143	FLUIDS/FLUID MECHANICS/LIQUIDS	32
QC155	HYDRODYNANICS/BUOYANCY/DISPLACEMENT	28
QC157	WAVES	60
QC161	GASSES	65
QC173	MATTER	78
QC174	MOTION	27
QC175	WORK	19
QC176	SOLIDS	14
QC225	SOUND/ACOUSTICS	113
QC254	HEAT	140
QC301	CHANGE OF STATE	42
QC320	HEAT TRANSFER	53
QC355	LIGHT	122
QC371	OPTICS	102
QC451	SPECTROSCOPY	25



Sample Gantt chart.

or course, at any level in school, will likely include over 100 skills or topics which students are supposed to learn about. Since most school districts offer over 100 courses in a K–12 program, more than 10,000 objectives need to be specified.

The conventional methods for preparing objectives, dreamed up by university theorists or state and federal regulation-makers, are replete with redundant rhetoric, and often require months of work. After training teachers in umpteen sites throughout the country to use those conventional formats and suffering their well-deserved wrath, we thought that there must be an easier way.

To abbreviate a long and somewhat painful story, we developed a curriculum system that is both stripped of all unnecessary verbiage and automated. It is based on the same category structure as the test system. It permits users to briefly code all instructional objectives with a fraction of the effort required by a manual system.

This approach has now been used in 140 school districts of all sizes and in all places. With an hour's training, teachers are able to use the system to designate what is being covered in their respective classes. In a one-day period, all objectives for all courses in a district can be coded.

We key in the coded objectives and produce several reports for the user districts. A basic report is a listing of objectives within a course by category, which goes to each teacher. Summary listings of all objectives for the district go to the administrator. For curriculum development, we can list the objectives for several related courses side by side, to let districts evaluate the scope and sequence of their programs. A statistical summary tabulates the number of objectives in each course, as well as their difficulty.

The nifty feature of the system is the ease with which curriculum content can be modified and improved. Once the data is in, it is a relatively mechanical problem to delete or change objectives. Other applications include the use of these objectives to key lesson plans by teachers and by principals to monitor classroom activities.

Another database has been developed by combining objectives from all districts served. By eliminating all duplicate and rarely-appearing objectives, we have assembled cumulative listings which summarize everything that a curriculum for any given topic probably ought to include.

Planning and Management

Educational administrators must continually deal with the management of multiple programs in multiple school buildings. For any given program, there may be several management tasks which must be performed, which are usually delegated to various personnel or agencies. Keeping track of all these things can be extraordinarily complicated. At the request of member districts, an automated management system has been developed to simplify the planning and monitoring process.

Basically, all critical activities are coded to an expected beginning and completed date, a person responsible, a facility, a program and a management category. Processing this data produces a Gantt chart, a graphic representation of activities tied to a time line. Any one such chart displays all of the activities expected to be completed in a 12-month period, the boundaries of which are specified by the user. The user may call for a chart showing all management tasks for the entire district, or for a particular person, facility, program or management category.

Each month, these charts are updated, at which time completion dates are added to each task record which has been finished. When producing the next Gantt chart, the system displays a "C" on the time line of the activity to show exactly when it was completed.

Other Applications

We are also using the microprocessor for other less innovative but significant tasks. One is the instructional media system. About 1000 16mm films are housed at this agency. The system produces camera-ready, updated film catalogs, by title and category. Also printed are film descriptions, appropriate grade levels and production dates.

Prior to having the computer, generating a catalog for less than half the present collection required at least six weeks. Now, it is merely a matter of entering annual additions and de-

```
SOCIAL STUDIES (6TH GRADE)
--------------------------------------

WORLD WAR I
   ALLIED POWERS                    K
   CENTRAL POWERS                   K

WORLD WAR II
   ALLIED POWERS                    C
   AXIS POWERS                      C
   HITLER                           C
   MUSSOLINI                        C
   NAZIS                            C
   PEARL HARBOR                     C

EARLY EXPLORATIONS OF AMERICA -1607
   CABOT                            C
   CARTIER                          C
   CHAMPLAIN                        C
   COLUMBUS                         C
   CORONADO                         C
   DE SOTO                          C
   HUDSON                           C
   MAGELLAN                         C
   PONCE DE LEON                    C
   RALEIGH                          C
   VESPUCCI                         C

1801-1809 JEFFERSON'S ADMIN.
   JEFFERSON                        C
   LEWIS & CLARK                    C
   LOUISIANA PURCHASE               C
   NAPOLEON                         C

1809-1817 MADISON'S ADMIN.
   STAR SPANGLED BANNER: KEY        C
   WAR OF 1812                      C

1861-1865 LINCOLN'S ADMIN.
   ASSASSINATION BY BOOTH           C
   LIFE OF LINCOLN                  C

CIVIL WAR
   APPOMATTOX COURT HOUSE           C
   CAUSES: SLAVERY                  C
   CAUSES: STATES RIGHTS            C
   CAUSES: TAXES                    C
   FORT SUMTER                      C
   GRANT & LEE                      C
   NEGRO LEADERS: DOUGLASS          C
   NEGRO LEADERS: GARRISON          C
   NEGRO LEADERS: TUBMAN            C
   NEGRO LEADERS: TURNER            C
   VICKSBURG & GETTYSBURG           C
```

Course objective report.

letions, and a new catalog is ready for distribution in less than a week. We also track monthly use of each film. By hand, this took an excellent staff member about two days monthly. By computer, this has been cut to less than two hours per month.

Also underway is a student-records system to maintain updated information in the special-education program. In addition to providing a host of information not otherwise readily available, we estimate that several weeks of office time will be saved in the preparation of the myriad of reports required by state and federal agencies.

Beasts, Goblins and Heroes

Making our way to where we are now, of course, included both great joy and abject woe.

The most time-consuming problem resulted from our not being aware at the outset that we needed to build files on the Winchester disk using file boundaries required by the hardware. We probably blew several months having to reinsert files due to repeated file control errors. But once we moved the files to appropriate addresses, the problem has not recurred.

A little over a year into the project, the hard disk started making unpleasant, stomach-disrupting noises. These were especially disconcerting since we had not bothered to back up everything properly. Fortunately, it held together long enough to put everything onto floppies. The local computer shop loaned us another hard disk and we were back in business within 24 hours.

Most of the rest of our down time, which actually has been a matter of a few days, has occurred during and after upgrades when we went to multitasking and from 1 to 2 MHz. Otherwise, about the only other significant problem has resulted from lightning occasionally knocking out the power and scrambling a file or two.

Current Directions

So far, access to the various systems we have produced is available only within the office. Users submit data and test orders, which we process and return by courier. One of the next steps will be to establish remote use of the test system through modems to terminals in member district schools. Although this is simple to do, we are proceeding cautiously, due to concern that the student users are likely to place a huge demand on the system. We have noted that students using the testing programs in the office are reluctant to quit.

Even if the C3B would actually support the 16 terminals OSI claims it will, our real intent is to have the testing and curriculum databases directly available on a much broader basis. To this end, we are exploring several other possibilities. These include publishing the databases in hardcopy format, converting them to run on other machines and producing chunks of the systems on floppy disks for distribution. The most promising avenue, however, is to bring up the system through one of the major telecommunications organizations.

In summary, we have been well-pleased with the hardware, often close to thrilled with the software, and, for the most part, satisfied with our progress. Most important, we feel that the work has progressed to the point that it could lead to significant improvements in American educational practices. ■

Read about one man's journey through computerdom to find the perfect word processing system.

Word Processing and Me

By Rod Hallen

I wrote this article in response to Wayne's editorial on word processing in the November 1980 issue of *Kilobaud Microcomputing*. I wanted to refute his claim that word processors aren't useful and to show that this field of small business is well covered. While I don't have any idea how many people are using word processors, I'm sure that word processing represents one of the largest single uses of microcomputers. (I recently read in one of the writer's magazines that one of the most successful science-fiction authors uses a setup similar to mine.)

My Initial System

Word processing has been the main task for the various microcomputers that I have owned in the past three and a half years. My search for the perfect word processor began in March 1977, when I purchased my first computer—a Processor Technology SOL. I needed a quick and easy way to type and retype a manuscript in order to get it to say what I wanted it to and also to get it clean and neat enough so that I wouldn't be ashamed to send it into a magazine publisher.

It didn't take me long to discover that two essential elements to any word processing system are a printer and a text editor. The Electric Pencil was already making a name for itself, and there was even a version that would work with the SOL's memory-mapped video display. The price seemed right, and so I bought a copy.

The choice of a printer presented a much more difficult task. They are expensive, and at that time there wasn't a wide selection. I finally bought a refurbished Carterfone I/O terminal, which was built around the IBM heavy-duty Selectric typing unit and some Datel circuit cards which provided an RS-232 serial interface. The interface to my computer wasn't difficult because the SOL also had a serial port.

The character coding presented a problem, however. Like all micros, the SOL spoke a language called ASCII, while IBM's machines all speak either EBCD or correspondence code. Mine was EBCD, which is transmitted serially with the last bit first; just the opposite of the method for sending ASCII.

I solved both of these problems with some home-brew software. I early on discovered that most difficulties were more easily solved using software than hardware. It is so much simpler to change a program step or two and try again than it is to make changes to a hardware prototype.

I did get into hardware a little bit though. The SOL only had one S-100 slot on the PC board, so I bought an 11-slot motherboard and a card extender from Godbout and connected them together with a short length of 100-conductor cable. Constructing a crude card cage and plugging the extender card into the sole SOL slot gave me 11 slots to play with. I quickly started filling these with memory, music, I/O and various other boards.

So now I had a word processor that used cassette tape for storage and a Selectric typewriter for output. The Electric Pencil was easy to learn and easy to use. The ability to revise without having to retype everything was definitely helping to improve my writing. Where before I would send in a manuscript after two or three revisions because I became tired of typing it over and over, I was now doing ten to 15 or more revisions, and the final copy was as clean and error free as my SOL and I could possibly make it.

A Disk-Based System

But the slow reading and writing of the cassette and the 15 characters per second printing speed of the Selectric were slowing me down and canceling out some of the advantages that I had gained by going to a computerized word-processing system. Just about that time the Teletype Model 43 came along with its 30 characters per second, its absolutely great-feeling keyboard and the reliability that I wasn't getting with the Selectric. The price was little more than I had paid for the Selectric and, even though it used the dot matrix method of creating characters on paper, the print quality wasn't too bad. So I sold the Selectric and bought a Model 43.

That doubled my hard-copy output, and the 43 never gave me a moment's trouble. The 11-inch-wide paper was hard to work with, but I set up the Electric Pencil print parameters as if I were using eight and a half inch paper and then cut off the excess with a razor. The results were quite acceptable.

My next project was to replace cassette storage. Disk seemed to be the

Rod Hallen, State Department—Accra, Washington, DC 20520.

only answer, but by now microcomputing was growing rapidly and my options were many. The first choice is disk size—full (eight inch) or mini (five inch) diskettes. At least I didn't have to take into consideration double density and double-sided drives at that time. Since many of my manuscripts get quite long, I decided that I needed the capacity of the larger disk. I finally settled on the DISCUS I from ThinkerToys. For the disk operating system (DOS), I chose CP/M from Digital Research.

My Electric Pencil wouldn't work with the new setup because it was designed for cassette storage. Fortunately, Michael Shrayer, the creator of the Electric Pencil, had come out with a CP/M version called Electric Pencil II that worked with my SOL video. It was much faster and more convenient than the cassette version, and I even returned my old version as part payment on the new one.

With this arrangement, reading and writing of disk storage was measured in seconds instead of the minutes that the cassette took, and my hard-copy printing capability had doubled. To the hobbyist concerned with his own entertainment, education or whatever, this improvement would probably not appear to be much of a return for the two thousand or so dollars that it cost me to upgrade my system, but when you are trying to earn a living, "time is money."

My word processor was fast, extremely helpful to my writing career and profitable. I was also using the SOL to create assembly language and BASIC programs, to play games and to perform various tasks in my business and personal life. Here was a hobby that was paying me while I was enjoying it. It temporarily satisfied my needs, until something faster and more efficient came along.

Enter TRS-80

At about this time I bought a TRS-80, became familiar with it and even tried to use it as a word processor. I built an RS-232 interface to couple it to my Model 43 (see "TRS-80 Printer Interfaces," January 1980 *Kilobaud Microcomputing*), but the uppercase-only keyboard was a major stumbling block and a king-size goof on the part of Radio Shack. I tried various keyboard mods but was never really happy with any of them.

In the meantime the machine paid for itself by serving as a test bed for many programs on the market aimed at the unwary novice, and I tried to sort them out for my readers. After a few months, however, I began to lose interest because the best programs available for the TRS-80 didn't begin to measure up to what was available for my CP/M-based machine. Besides, I was getting very tired of playing games, games, games...

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I used the TRS-80 less and less. I tried to revive my interest by tying it to my big machine, so that it would have access to disks, the high-speed printer that I had subsequently acquired and much more software. But it slowly faded away and began to gather dust while my word processor was bright and shiny from overuse.

Printer with a Difference

I replaced my Model 43 printer with a Malibu 160 and increased my print speed by a factor of five. I was now cranking out hard copy at an incredible 165 characters per second! The Malibu 160 is a dot matrix printer with a difference. The character set is stored in software and it is easily changed.

The Malibu also introduced me to bidirectional printing. If the printhead was closer to the end of the line than the beginning when it finished a line, it would print the next line backwards. This saved the time normally wasted while the printhead is returning to the beginning of each new line and increased throughput. Bidirectional printing is easily implemented in software, but it does require a printer that is designed to handle it. The Malibu handled any size paper, whereas the 43 was limited to the 11-inch width. It would even print labels and envelopes under computer control, which turned out to be a real time-saver.

A Complete Changeover

But I was still not completely satisfied. I wanted a 24 by 80 video display instead of the SOL's 16 by 64; I was becoming extremely interested in the Z-80 microprocessor for both its speed and powerful instruction set; I wanted to learn more about double-density disk controllers, which were just beginning to come on the scene; and finally, I still wanted a typewriter-quality printer.

To accomplish all of my goals, I knew I would have to replace almost my entire computer system.

First, I sold the SOL and bought a Cromemco Z-2, but I kept some of my memory and I/O boards to cut down on cost. Then I bought an Imsai VIO video interface board at half price from a dealer who was going out of business. Modifying my CP/M I/O drivers so that they would work with the Z-2 was no problem, but I did have to trade in my Electric Pencil II for the VIO version, and then I was back in business again. Operations proceeded at a quicker pace due to the larger screen and faster processor.

I traded in my controller for the DISCUS 2D version and used it with my existing Shugart 801 drives which had increased from one to two somewhere along the line. Along with the 2D came a double-density version of CP/M. One of the advantages of double-density disk recording is the ability to get twice as much data on each disk. Another plus is that reading and writing takes less time because each turn of the disk contains more data.

After much soul searching, I finally broke down and bought a NEC Spinwriter 5525 keyboard-printer, which had the print quality of the Selectric and almost four times the print speed.

Software

The Electric Pencil served admirably as word-processing software for a long time but it has one serious fault: files created by the Pencil were not completely compatible with those created by my CP/M text editor ED.

This becomes quite noticeable when you write a lot of assembly-language programs.

Then I saw an ad for the Magic Wand, and I knew that it was what I wanted. It was loaded with features, had a screen-oriented editor like the Pencil and could directly create program files for the CP/M assembler. I acted quickly and scooped up Magic Wand serial number 1! At the present time I have at least eight word-processing software packages and I have given them all a fair trial, but I still think that the Magic Wand is best.

Conclusions

In looking back over the many incidents that have made my involvement in microcomputing interesting, exciting and sometimes frustrating, I see that almost nothing worked the first time. Bad components, faulty construction (especially when I was the constructor), miserable documentation, lack of knowledge on my part and many other minor difficulties conspired to drag me down and discourage me. I can't help but wonder how many others ran into these same problems and gave up rather than fight them. Although I had no computer experience whatsoever when I started, I did have a solid electronics background and that really helped.

Thankfully, many of the things that created my frustrations have greatly improved. Poor documentation has always been my strongest complaint and while there is still room for improvement, it is much more readable and helpful than it used to be. Early computer vendors were mostly hardware types who seemed to assume that you knew as much about their products as they did. This, of course, wasn't true, and it took them a long time to figure that out. Unfortunately, most of them weren't very good business managers, and they have disappeared from the scene.

Hardware reliability has been phenomenal once the initial burn-in period has passed. Of the hundreds of integrated circuits that occupy my printed circuit boards, I haven't had to replace more than five or six in three and a half years.

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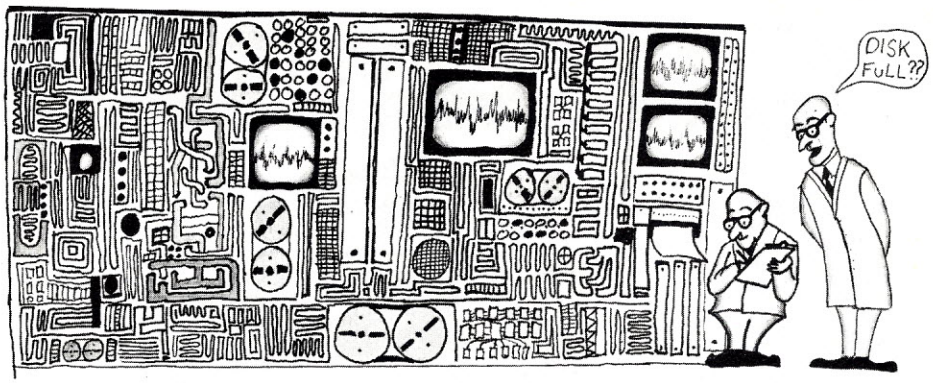
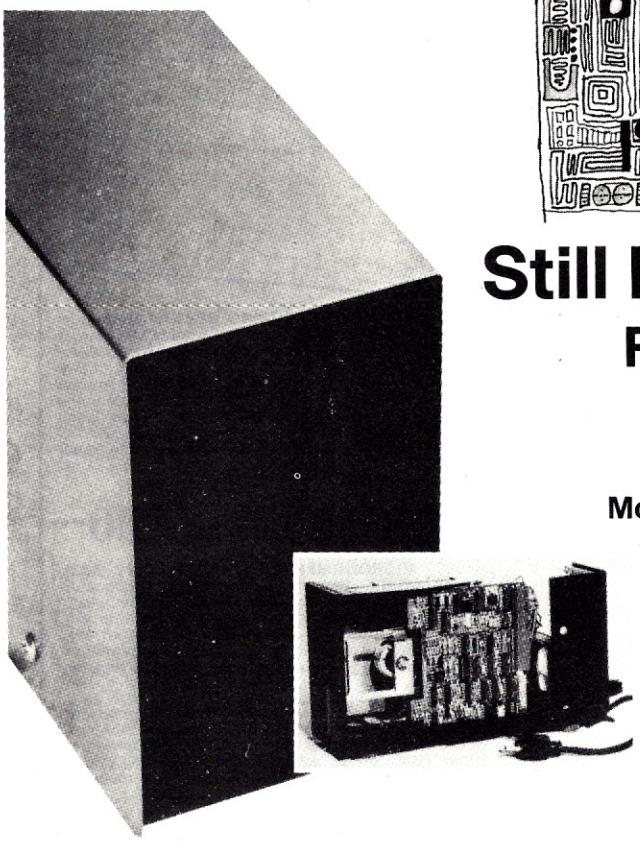
At the moment I'm happy with my present word-processing system, but who knows for how long. By the way, my new Godbout/Compupro 8085/8088 CPU board arrived the other day. I wonder who will be the first out with a word processor that runs in 8086 code.■





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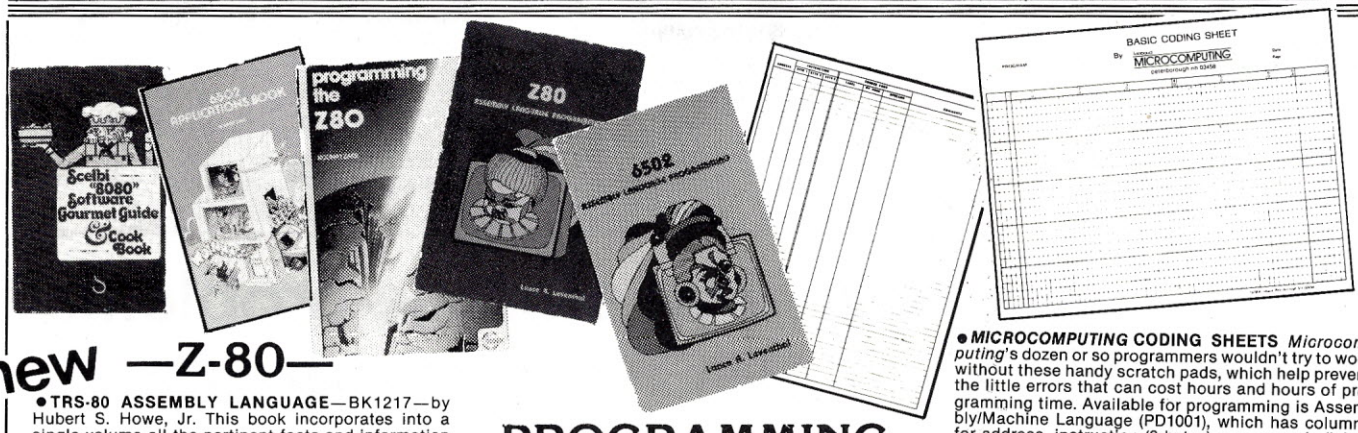

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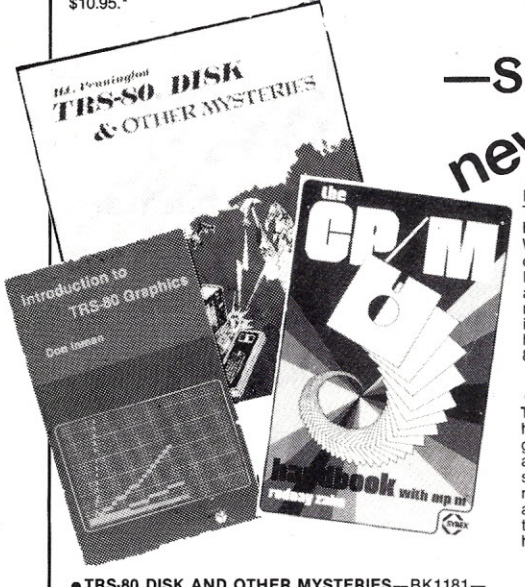

new

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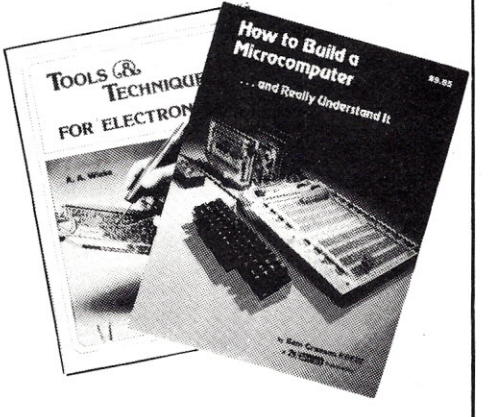

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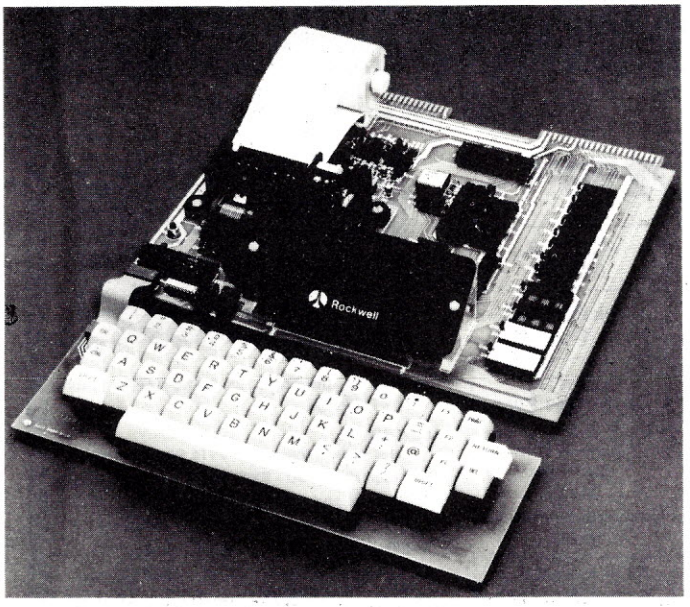

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- Both connectors are KIM-1 compatible

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32K S-100 EPROM CARD

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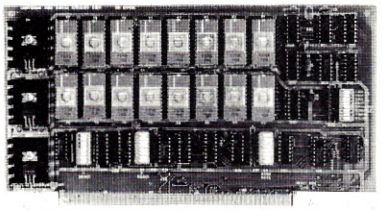

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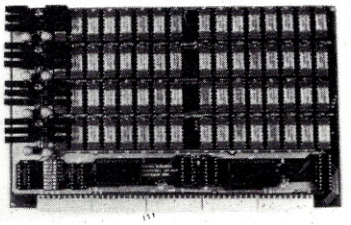

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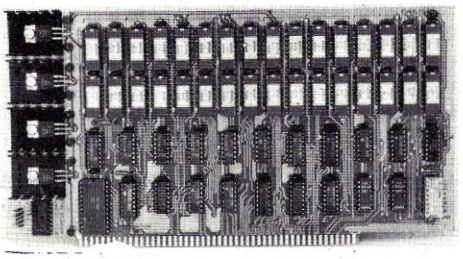

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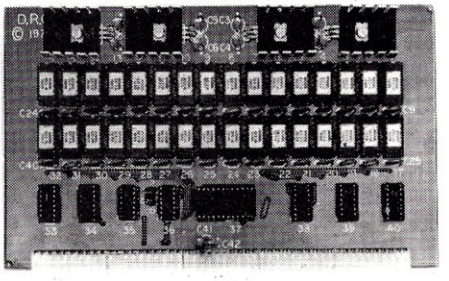

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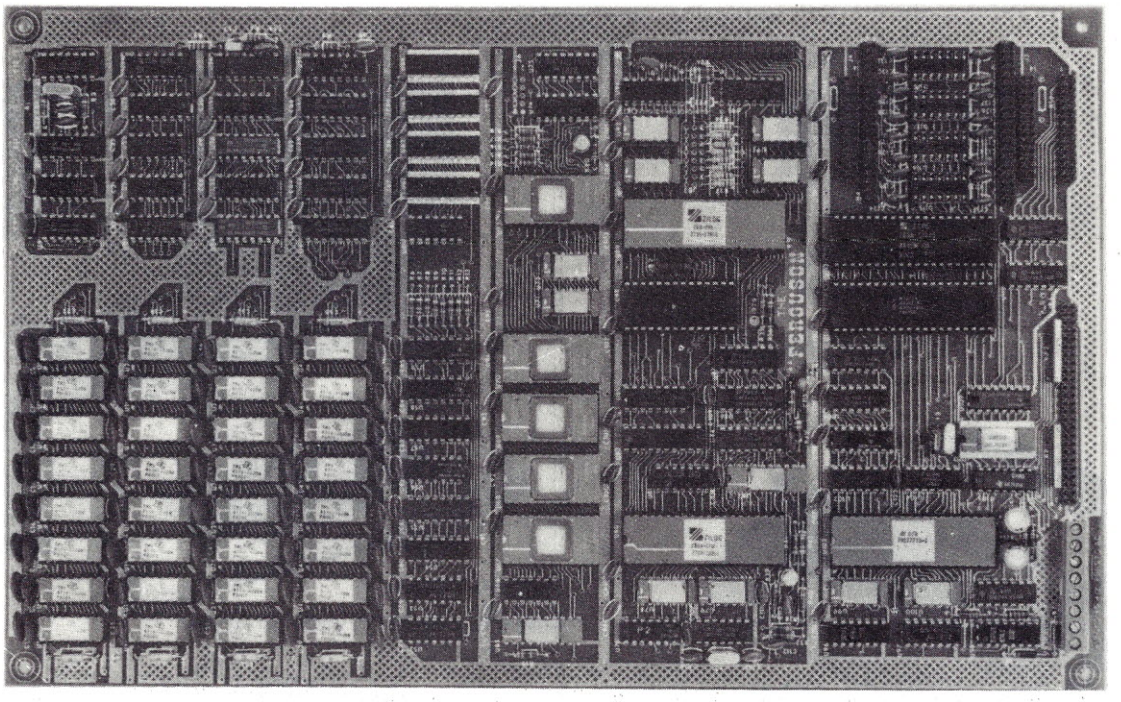

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SYSTEM COMPARISON

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80 x 24 Video Kit	365.00
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Z-80 CPU Kit	185.95
SER & PAR. I/O	129.95
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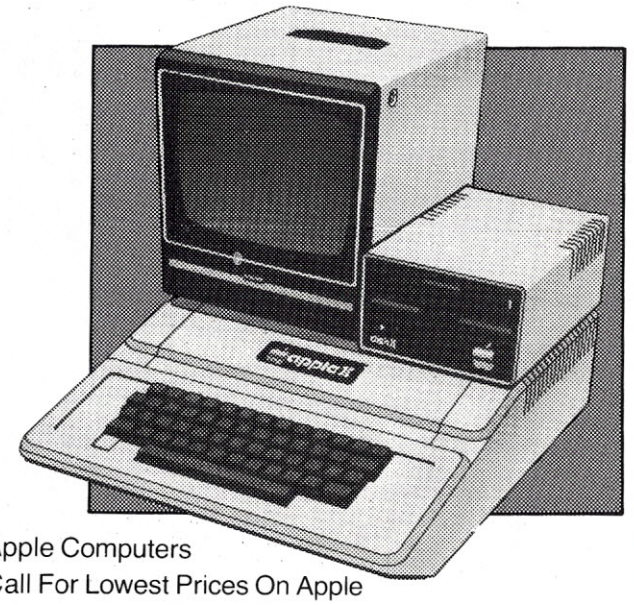

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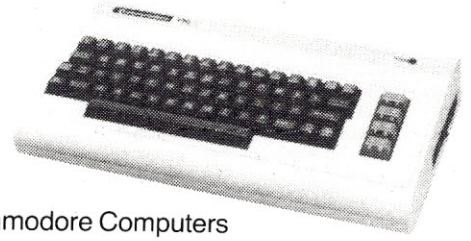

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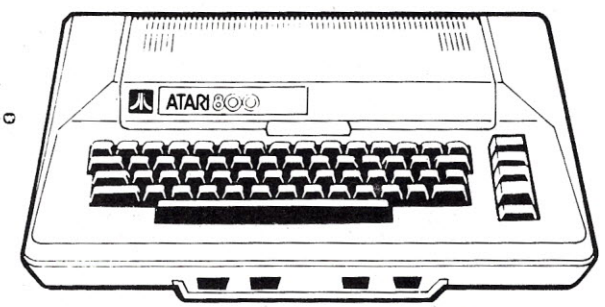

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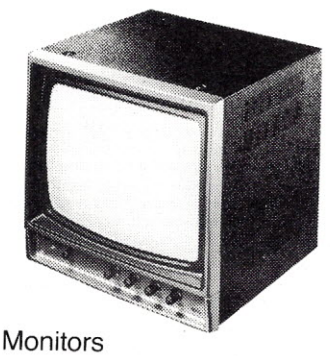

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Flexible Disc 1s	IBM Compatible (128 B/S, 26 sectors)	3060	2.19	5FD-111110	473071	53428	CM-F11	800506	2305830	40013	FD1-128	FD-1	740-0	S/A 100	15002	FD34-1000	F111111X	7870-K	421602
	IBM Compatible (128 B/S, 26 sectors) w/ W.P.N.	3062	2.24	–	–	–	–	–	–	–	–	–	740-0	–	–	–	–	–	–
	IBM Compatible (128 B/S, 26 sectors) w/ W.P.N. & Hub ring	3064	2.55	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Single-Headed Drives	IBM Compatible (128 B/S, 26 sectors) REVERSIBLE	1729	3.35	5FD-113110	473072	54431	–	–	–	40015	–	FD-2	740/2-0	–	15150	FF34-2000	F171111X	7860-K	–
Single-Density Media	IBM System 6 Compatible	3066	2.19	–	473077	54561	–	800509	1669959	40014	–	–	740-0 DS8	–	15003	FD60-1000	F116111X	–	–
	IBM Compatible (256 B/S, 15 sectors)	3109	2.19	5FD-111210	473073	–	–	800584	2305845	40040	–	–	740-3600	–	15005	FD36-1000	F112111X	7861-K	–
	IBM Compatible (512 B/S, 8 sectors)	3110	2.19	–	473074	–	–	800585	1669954	40044	–	–	–	–	15004	FD60-1000	F113111X	7889-K	–
	Shugart Compatible, 32 hard sector	3015	2.19	5FD-211010	470901	53802	CM-F21	101/1	–	40016	FH1-32	FD-132	740-32	S/A-101	15025	FD32-1000	–	7890-K	421322
	Shugart Compatible, 32 hard sector REVERSIBLE	3025	3.35	5FD-213010	–	–	–	–	–	40017	–	–	740/2-32	–	15151	FF32-2000	–	7880-K	–
	Wang Compatible, 32 hard sector w/Hub ring	3087	2.50	–	–	54491	–	–	–	–	–	–	740-32RM	–	–	–	F37A411X	–	–
	CPT 8000 Compatible	3045	2.79	–	–	–	–	–	–	–	–	–	–	–	15226	–	–	–	–
Flexible Disc 1d	IBM Compatible (128 B/S, 26 sectors)	3090	2.95	5FD-121010	474071	54568	–	3740/1D	–	40047	FD1-128/M2100	FD-1D	741-0	–	–	FD34-8000	F131111X	7857-K	423002
	Soft Sector (128 B/S, 26 sectors) REVERSIBLE	3093	3.99	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Single-Headed Drives	Shugart Compatible, 32 hard sector	3091	2.95	5FD-221010	470801	54596	–	101/1D	–	40024	FH1-32D	–	741-32	S/A-103	15075	FD32-8000	F33A410X	7887-K	423322
Double-Density Media	Shugart Compatible, 32 hard sector REVERSIBLE	3094	3.99	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Wang Compatible, 32 hard sector w/Hub ring	3088	3.20	–	–	–	–	–	–	–	–	–	–	–	–	–	F22A411X	–	–
Flexible Disc 2s	Soft Sector (Unformatted)	3101	3.84	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Soft Sector (128 B/S, 26 sectors)	3113	3.84	–	–	54428	–	800814	1766870	–	–	–	–	S/A-150	15153	FD10-4026	F121111X	–	–
Double-Headed Drives	Soft Sector (256 B/S, 15 sectors)	3106	3.84	–	473477	54226	–	800815	2736700	40043	FD2-256D	–	742-0	–	15154	FD10-4015	F122111X	7856-K	424612
Single-Density Media	32 Hard Sector	3108	3.84	–	–	–	–	–	–	–	FH2-32	–	–	–	–	–	–	–	–
Flexible Disc 2d	Soft Sector (Unformatted)	3102	3.49	–	473485	–	–	DY150	–	40026	FD2-XDM	FD-2D	743-0	–	15103	DD34-4001	–	–	425002
	Soft Sector I (128 B/S, 26 sectors)	3115	3.49	–	–	–	–	–	–	–	–	–	–	S/A-150	–	–	–	–	–
Double-Headed Drives	Soft Sector I (256 B/S, 26 sectors)	3103	3.49	–	473471	54325	–	800817	1766872	40019	FD2-2560	–	743-0/256	–	15101	DD34-4026	F144111X	7858-K	425602
Double-Density Media	Soft Sector I (512 B/S, 15 sectors)	3114	3.49	–	473472	54479	–	800818	1669044	40039	–	–	743-0/512	–	15100	DD34-4015	F145111X	–	425612
	Soft Sector (1024 B/S, 8 sectors)	3104	3.49	–	473473	54485	–	800819	1669045	40020	–	–	743-0/1024	–	15102	DD34-4008	F147111X	7859-K	425622
	32 Hard Sector	3105	3.49	5FD-321010	470851	–	–	101/2D	–	40021	FH2-32D	–	743-32	S/A-151	15125	DD32-4000	F34A411X	7881-K	425322
	Burroughs B-80 Compatible 32 Hard Sector	3092	3.49	–	–	–	–	–	–	–	–	–	–	–	–	–	F34A611X	–	–
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	Soft Sector (Unformatted) W/Hub Ring	3431	2.19	–	–	–	–	–	–	–	–	–	–	–	–	MD525-01	–	–	–
	10 Hard Sector, w/Hub Ring	3433	2.19	–	–	–	–	–	–	–	–	–	–	–	–	MD525-10	–	–	–
	16 Hard Sector, w/Hub Ring	3435	2.19	–	–	–	–	–	–	–	–	–	–	–	–	MD525-16	–	–	–
Mini Flexible Disc 1d	Soft Sector	3417	2.24	–	–	54646	–	104/1D	–	–	–	–	–	–	–	MD540-01	–	–	–
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Double-Density Media	16 Hard Sector	3419	2.24	–	–	54652	–	105/1D	–	–	–	–	–	–	–	MD540-16	–	–	–
Mini Flexible Disc 2d	Soft Sector	3421	2.74	–	–	54624	–	104/2D	–	–	MD2-D	–	745-0	S/A-154	–	MD550-01	–	–	–
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Double Density Media	16 Hard Sector	3425	2.74	–	–	54630	–	105/2D	–	–	MH2-D	–	745-16	S/A-155	–	MD550-16	–	–	–

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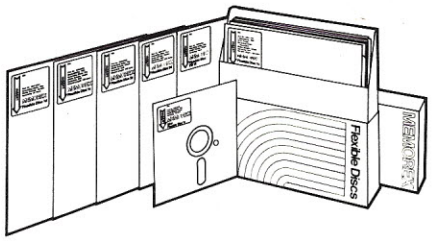

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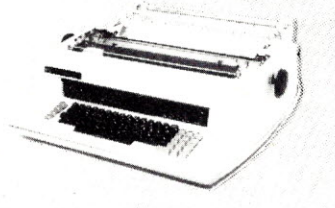

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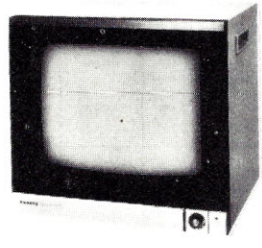

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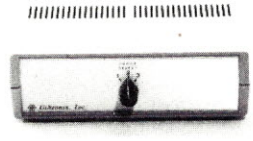

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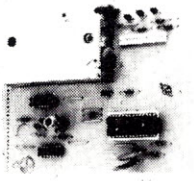

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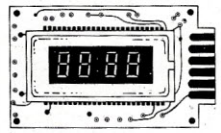

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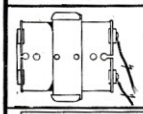

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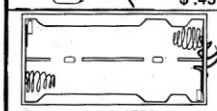

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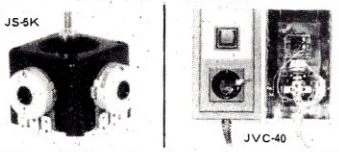

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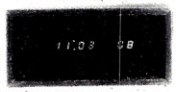

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1702A	2K UV Erasable PROM	5.95
2708	8K EPROM	4.95
TMS2716	16K EPROM (-5V, +5V, +12V)	9.95
2716Intel(2516)TI	16K EPROM (Single +5V)	8.95
2732Intel TI	32K EPROM	17.95
2758	8K EPROM (450ns) (Single +5V)	7.49
2764Q	64K EPROM (Hitachi HN462764)	49.95
5203	2048 PROM	14.95
82S23(74S188)	32x8 PROM (Open Collector)	3.95
82S115	4096 Bipolar PROM	14.95
82S123(74S288)	32x8 Tri-State Bipolar PROM	3.95
82S185	8K PROM	16.95

— Over 30 More PROMS Listed in Our Catalog —

ROM'S

2513(2140)	Character Generator (Upper Case)	9.95
2513(3021)	Character Generator (Lower Case)	9.95

NMOS READ ONLY MEMORIES

MCM66710P	128x9x7 ASCII Shifted w/Greek	13.50
MCM66740P	128x9x7 Math Symbol & Pictures	13.50
MCM66750P	128x9x7 Alpha. Control Char. Gen.	13.50

MICROPROCESSOR MANUALS

M-Z80	User Manual	7.50
M-CDP1802	User Manual	7.50
M-2650	User Manual	5.00

SPECIAL FUNCTION

DS0025CN	Dual MOS Clock Driver (SMZ)	3.50
DS0026CN	Dual MOS Clock Driver (SMZ)	1.95
INS1771N-1	Floppy Disc Controller	24.95
INS2651N	Communication Chip	19.95
MM58167N	Microprocessor Real Time Clock	8.95
MM58174N	Microprocessor Compatible Clock	11.95
COP402N	Microcontroller with 64-Digit RAM and Direct LED Drive	6.95
COP402MN	Microcontroller with 64-Digit RAM & Direct LED Drive w/N Buss Int.	7.49
COP470N	32-Seg.VAC Fluor. Driver (20-pin pkg.)	3.25

TELEPHONE/KEYBOARD CHIPS

AY-5-9100	Push Button Telephone Dialer	14.95
AY-5-9200	Repertory Dialer	14.95
AY-5-9500	CMOS Clock Generator	4.95
AY-5-2376	Keyboard Encoder (88 keys)	11.95
HD0165-5	Keyboard Encoder (16 keys)	7.95
74C922	Keyboard Encoder (16 keys)	5.49
74C923	Keyboard Encoder (20 keys)	5.75
MM53190N	Push Button Pulse Dialer	7.95
MM57499N	96/144-Key Serial Keyboard Encoder	8.95

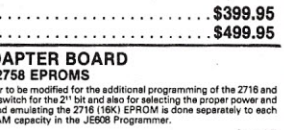
ELECTRONIC TOY MOTORS

Typical Power Source	Operating Voltage Range	TYPICAL CHARACTERISTICS — NO LOAD			AT MAXIMUM EFFICIENCY					SMALL TORQUE
		Voltage	Speed RPM	Current AMP	Speed RPM	Current AMP	Torque OZ. IN.	Output W	Eff. %	OZ. IN.
DRY CELL	1.5-6.0	3.0	9,200	0.20	6,750	0.90	0.260	1.30	57.0	0.97

.937 O.D. X 1.201 Length

MABUCHI RE280 $ .99 each . . .10/$7.50 . . .100/$50.00

JE608 PROGRAMMER
2704/2708 EPROM PROGRAMMER



GENERAL APPLICATIONS:
- **To program EPROMS 2704 and 2708.**
- **Developmental system for microcomputer circuits**
- **To read the contents of a pre-programmed EPROM**
- **To compare EPROM(s) for content differences**
- **To emulate a programmed EPROM**
- **To store program in RAMS for alterations**
- **Three separate Display Registers: 8 LED's for Hex Key entries, 10 LED's (2⁴-2⁹) for Address Register and 8 LED's for Data Memory Register. The Data Memory Register displays the content of the RAMs from the EPROM Chip. Development of microprocessor systems by means of a ribbon cable from the programmer panel test socket to the EPROM socket on the microprocessor board. Rapid checking verification of programmed data changes. User may move data from a master to RAM's or write into RAM's with keyboard entries. Allows manual stepping manipulation (up and down) at any address location. Stand-alone EPROM Programmer consisting of: A 19-key Hexadecimal Keyboard assembly, Programmer Board assembly with 4 power supplies and a LED/Test Socket Panel Board assembly. The Test Socket is zero force insertion type. Power requirements: 115VAC, 60Hz, 6W. Compact desk-top enclosure: Color-coordinated designer's case with light tan panels and molded end pieces in mocha brown. Size: 3¼"H x 11"W x 8¾"D. Weight: 5 lbs.**

The JE608 EPROM Programmer is a completely self-contained unit which is independent of computer control and requires no additional systems for its operations. The EPROM can be programmed from the Hexadecimal Keyboard or from a pre-programmed EPROM. The JE608 Programmer can emulate a programmed EPROM by the use of its internal RAM circuits. This will allow the user to test or pretest a program for a system, prior to programming a chip. Any changes in the program can be entered directly into the memory circuits with the Hexadecimal Keyboard so that rewriting the entire program will not be necessary. The JE608 Programmer contains a Programmer/Board w/25 IC's & includes power supplies of: -5V, +5V, +12V and +26V. The Hexadecimal Keyboard and LED/Test Socket Panel board are separate assemblies within the system.

JE608K Kit $399.95
JE608A Assembled and Tested $499.95

JE608-16K ADAPTER BOARD
FOR 2716/2758 EPROMS

GENERAL DESCRIPTION:
The JE608-16K Adapter Board allows the JE608 Programmer to be modified for the additional programming of the 2716 and 2758 EPROMS. The adapter provides for adding an address switch for the 2¹¹ bit and also for selecting the proper power and timing pulses to be applied to the EPROM. Programming and emulating the 2716 (16K) EPROM is done separately to each half (1024x8) of the EPROM because of the existing 8K RAM capacity in the JE608 Programmer.

JE608-16K	Adapter Board Kit **$29.95**
JE608-Upgrade	(Send assembled JE608 to factory for adapter installation . . . . . **$99.95** of the JE608-16K Adapter Board Kit)
JE608A-16K Mod.	Assembled JE608 w/Adapter (JE608-16K) Installed **$599.95**

$10.00 Min. Order — U.S. Funds Only
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BOOKS
National Semiconductor — Intersil — Intel

30001	**National CMOS Data Book** (640 pages) 74C, CD4000, and A/D Converters	$5.95
30002	**National Interface Data Book** (704 pages) DP, DS8000, DS3600, DS75000, etc.	$5.95
30003	**National Linear Data Book** (1376 pages) LM, LF, ADC, DAC, LH Series	$7.95
30004	**National Series 80 — Board Level Computer** (224 pages)	$4.95
30005	**National TTL Logic Data Book** (624 pages) 7400,LS,L,H,S, and DM8000 Series	$6.95
30006S	**Buy above (5) 30001,2,3,4,5 as a set**	$24.95/lot
30009	**Intersil Data Book** (1074 pages)	$6.95
010400	**Intel Component Data Catalog** Full data sheets for Intel's products incl. memory devices, microproc., peripherals & indust./mil. products (1328 pages)	$10.00
205610	**Intel Peripheral Design Handbook** Full data sheets, appl. notes for Intel peripheral device components (644 pages)	$7.50

AC and DC Wall Transformers

Ideal for use with clocks, games, power supplies or any other type of AC or DC application.

Part No.	Input	Output	Price
AC 250	117V/60Hz	12 VAC 250mA	$3.95
AC 500	117V/60Hz	12 VAC 500mA	$4.95
AC1000	117V/60Hz	12 VAC 1 amp	$5.95
AC1700	117V/60Hz	9 VAC 1.7 amp	$3.95
DV 9200	117V/60Hz	9 VDC 200mA	$3.25
DC 900	120V/60Hz	9 VDC 500mA	$3.95

CONNECTORS

DB25P	D-Subminiature Plug	$2.95
DB25S	D-Subminiature Socket	$3.50
D20418-2	Screw Lock Hdwr. (2) DB25S/P	2/$.99
DB51226	Cover for DB25P/S	$1.75
22/44SE	P.C. Edge (22/44 Pin)	$2.95
UG88/U	BNC Plug	$1.79
UG89/U	BNC Jack	$3.79
UG175/U	UHF Adapter	$ .49
SO239	UHF Panel Recp.	$1.29
PL258	UHF Adapter	$1.60
PL259	UHF Plug	$1.60
UG260/U	BNC Plug	$1.79
UG1094/U	BNC Bulkhead Recp.	$1.29

TRS-80 16K Conversion Kit

Expand your 4K TRS-80 System to 16K.
Kit comes complete with:
- ★ 8 ea. MM5290 (UPD416/4116) 16K Dyn. Rams (*NS)
- ★ Documentation for Conversion

TRS-16K2 *150NS	$29.95
TRS-16K3 *200NS	$24.95
TRS-16K4 *250NS	$19.95

JE610 ASCII Encoded Keyboard Kit

The JE610 ASCII Keyboard Kit can be interfaced into most any computer system. The kit comes complete with an industrial grade keyboard switch assembly (62-keys), IC's, sockets, connector, electronic components and a double-sided printed wiring board. The keyboard assembly requires +5V @ 150mA and −12V @ 10 mA for operation. Features: 60 keys generate the 126 characters, upper and lower case ASCII set. Fully buffered. Two user-define keys provided for custom applications. Caps lock for upper-case-only alpha characters. Utilizes a 2376 (40-pin) encoder read-only memory chip. Outputs directly compatible with TTL/DTL or MOS logic arrays. Easy interfacing with a 16-pin dip or 18-pin edge connector. Size: 3½"H x 14½"W x 8¾"D

JE610/DTE-AK (After assembled as pictured above) . . . **$124.95**

JE610 Kit 62-Key Keyboard, PC Board, & Components (no case). . . . **$ 79.95**
K62 62-Key Keyboard (Keyboard only) . . . **$ 34.95**
DTE-AK (case only — 3¼"Hx11"Wx8¾"D) **$ 49.95**

NEW! **JE212 — Negative 12VDC Adapter Board Kit for JE610 ASCII KEYBOARD KIT**
Provides -12V DC from incoming 5VDC . . **$9.95**

JE600 Hexadecimal Encoder Kit

FULL 8-BIT LATCHED OUTPUT 19-KEY KEYBOARD

The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation. Size: 3½"H x 8¾"W x 8¾"D

JE600/DTE-HK (After assembled as pictured above) **$99.95**

JE600 Kit 19-Key Hexadec. Keyboard, PC Board & Cmpnts. (no case) . . **$59.95**
K19 19-Key Keyboard (Keyboard only) **$14.95**
DTE-HK (case only — 3½"Hx8¾"Wx8¾"D) **$44.95**

7400

SN7400N	.20	SN7472N	.29	SN74156N	.79
SN7401N	.20	SN7473N	.35	SN74157N	.69
SN7402N	.25	SN7474N	.35	SN74160N	.89
SN7403N	.25	SN7475N	.49	SN74161N	.89
SN7404N	.25	SN7476N	.35	SN74162N	.89
SN7405N	.29	SN7479N	5.00	SN74163N	.89
SN7406N	.35	SN7480N	.50	SN74164N	.89
SN7407N	.35	SN7482N	.99	SN74165N	.89
SN7408N	.29	SN7483N	.69	SN74166N	1.25
SN7409N	.29	SN7485N	.89	SN74167N	2.79
SN7410N	.25	SN7486N	.35	SN74170N	1.95
SN7411N	.29	SN7489N	1.75	SN74172N	4.95
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SN7413N	.40	SN7491N	.59	SN74174N	.99
SN7414N	.69	SN7492N	.45	SN74175N	.89
SN7416N	.29	SN7493N	.45	SN74176N	.79
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SN7420N	.25	SN7495N	.69	SN74179N	1.49
SN7421N	.29	SN7496N	.69	SN74180N	.79
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SN7423N	.29	SN74100N	1.49	SN74182N	.79
SN7425N	.29	SN74104N	.89	SN74184N	2.49
SN7426N	.29	SN74105N	.89	SN74185N	2.49
SN7427N	.25	SN74107N	.35	SN74190N	1.25
SN7428N	.49	SN74109N	.39	SN74191N	1.25
SN7430N	.25	SN74116N	1.95	SN74192N	.89
SN7432N	.29	SN74121N	.39	SN74193N	.89
SN7437N	.25	SN74122N	.55	SN74194N	.89
SN7438N	.40	SN74123N	.59	SN74195N	.69
SN7439N	.25	SN74125N	.49	SN74196N	.89
SN7440N	.20	SN74126N	.49	SN74197N	.89
SN7441N	.89	SN74132N	.75	SN74198N	1.49
SN7442N	.59	SN74136N	.75	SN74199N	1.49
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SN7446N	.79	SN74144N	3.49	SN74279N	.79
SN7447N	.69	SN74145N	.79	SN74283N	1.49
SN7448N	.79	SN74147N	1.95	SN74284N	3.95
SN7450N	.20	SN74148N	1.29	SN74285N	3.95
SN7451N	.20	SN74150N	1.25	SN74365N	.69
SN7453N	.20	SN74151N	.69	SN74366N	.69
SN7454N	.20	SN74152N	.69	SN74367N	.69
SN7459A	.25	SN74153N	.79	SN74368N	.69
SN7460N	.20	SN74154N	1.25	SN74390N	1.49
SN7470N	.29	SN74155N	.79	SN74393N	1.49

74LS

74LS00	.29			74LS192	1.15
74LS01	.29			74LS193	1.15
74LS02	.29	74LS92	.75	74LS194	1.15
74LS03	.29	74LS93	.75	74LS195	1.15
74LS04	.35	74LS95	.99	74LS197	1.19
74LS05	.35	74LS96	1.15	74LS221	1.19
74LS08	.35	74LS107	.45	74LS240	1.49
74LS09	.35	74LS109	.45	74LS241	1.49
74LS10	.35	74LS112	.45	74LS242	1.49
74LS11	.39	74LS113	.49	74LS243	1.49
74LS12	.35	74LS114	.49	74LS244	1.49
74LS13	.59	74LS122	.89	74LS245	2.95
74LS14	.99	74LS123	1.25	74LS247	1.19
74LS15	.35	74LS125	.59	74LS248	1.19
74LS20	.35	74LS126	.59	74LS249	1.19
74LS21	.35	74LS132	.99	74LS251	.99
74LS22	.35	74LS133	.89	74LS253	.99
74LS26	.35	74LS136	.49	74LS257	.89
74LS27	.35	74LS138	.89	74LS258	.69
74LS28	.35	74LS139	.89	74LS260	.69
74LS30	.35	74LS151	.89	74LS266	.69
74LS32	.35	74LS153	.89	74LS273	1.95
74LS33	.59	74LS154	1.75	74LS279	.89
74LS37	.45	74LS155	.89	74LS283	.89
74LS38	.39	74LS156	.89	74LS290	.99
74LS40	.35	74LS157	.89	74LS293	.99
74LS42	.89	74LS158	.89	74LS298	1.25
74LS47	.89	74LS160	1.15	74LS352	1.29
74LS48	1.15	74LS161	1.15	74LS353	1.29
74LS49	1.15	74LS162	1.15	74LS365	.69
74LS51	.35	74LS163	1.15	74LS366	.69
74LS54	.35	74LS164	1.15	74LS367	.69
74LS55	.35	74LS165	1.15	74LS368	.69
74LS73	.45	74LS168	1.19	74LS373	1.95
74LS74	.45	74LS169	1.19	74LS374	1.95
74LS75	.59	74LS170	1.95	74LS375	.89
74LS76	.45	74LS173	.99	74LS386	.69
74LS78	.49	74LS174	.99	74LS393	2.49
74LS83	.89	74LS175	.99	74LS399	2.49
74LS85	1.25	74LS181	2.95	74LS670	2.49
74LS86	.49	74LS190	1.25	81LS95	1.95
74LS90	.69	74LS191	1.25	81LS97	1.95

74S

74S00	.45			74S243	3.25
74S02	.45			74S244	3.25
74S03	.45	74S124	3.95	74S251	1.45
74S04	.55	74S133	.55	74S253	1.45
74S05	.55	74S134	.69	74S257	1.35
74S08	.50	74S135	1.19	74S258	1.35
74S09	.50	74S136	1.75	74S260	.79
74S10	.45	74S138	1.35	74S280	2.95
74S11	.45	74S139	1.35	74S287	3.25
74S15	.45	74S140	.79	74S288	2.75
74S20	.45	74S151	1.35	74S373	3.49
74S22	.45	74S153	1.35	74S374	3.49
74S30	.45	74S157	1.35	74S387	2.95
74S32	.55	74S158	1.35	74S471	10.95
74S38	1.25	74S160	2.95	74S472	10.95
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74S51	.45	74S175	1.59	74S474	12.95
74S64	.50	74S188	2.95	74S475	12.95
74S65	.50	74S194	1.95	74S570	5.95
74S74	.75	74S195	1.95	74S571	5.95
74S86	.79	74S196	1.95	74S572	9.95
74S112	.79	74S240	2.95	74S573	9.95
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74S114	.79	74S242	3.25	74S941	3.15

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CA3023H	3.25	CA3080H	1.25	CA3130H	1.39
CA3035H	2.49	CA3081N	2.00	CA3140H	1.25
CA3039H	1.35	CA3082N	2.00	CA3160H	1.25
CA3046N	1.30	CA3083N	1.60	CA3401N	.59
CA3059N	3.25	CA3086N	.85	CA3600N	3.50

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CD4000	.39			CD 4098	2.49
CD4001	.39			CD4506	.75
CD4002	.39			CD4507	.99
CD4006	1.19	CD4041	1.49	CD4508	3.95
CD4007	.25	CD4042	.99	CD4510	1.39
CD4009	.49	CD4043	.89	CD4511	1.29
CD4010	.49	CD4044	.89	CD4512	1.49
CD4011	.39	CD4046	1.79	CD4514	3.95
CD4012	.25	CD4047	2.50	CD4515	2.95
CD4013	.49	CD4048	1.35	CD4516	1.49
CD4014	1.39	CD4049	.49	CD4518	1.79
CD4015	1.19	CD4050	.69	CD4519	.89
CD4016	.59	CD4051	1.19	CD4520	1.29
CD4017	1.19	CD4052	1.19	CD4526	1.79
CD4018	.99	CD4053	1.19	CD4528	1.79
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CD4020	1.19	CD4059	9.95	CD4543	2.79
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CD4022	1.19	CD4066	.79	CD4566	2.79
CD4023	.29	CD4068	.39	CD4583	2.49
CD4024	.79	CD4069	.45	CD4584	.75
CD4025	.23	CD4070	.55	CD4723	1.95
CD4026	2.95	CD4071	.49	CD4724	1.95
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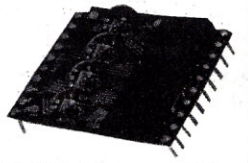
CD4029	1.49	CD4075	.39	MC14411	15.95
CD4030	.49	CD4076	1.39	MC14412	15.95
CD4034	3.49	CD4078	.55	MC14419	7.95
CD4035	.99	CD4081	.39	MC14433	15.95
CD4040	1.49	CD4082	.39	MC14538	2.49
		CD4093	.99	MC14541	1.95

4-Digit 16 Segment Alphanumeric Intelligent Display with Memory, Recorder, Driver

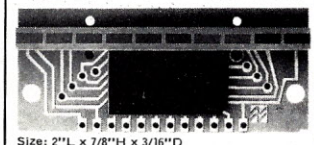


End-stackable, 4-character package. High contrast, 160mil high, magnified monolithic characters. 64-Character ASCII format. Built-in memory, decoder, multiplexer and drivers. Direct access to each digit independently and asynchronously. Five volt logic, TTL compatible. Five volt power supply only. Independent cursor function. Size: 1"L x 1-3/16"H x .225"D.

DL-1416 Alphanumeric Display $19.95 ea.

10-Segment Bargraph Displays

(with On-Board Driver IC-Chip)



Size: 2"L x 7/8"H x 3/16"D

bar or dot display mode externally selectable by user. Packages are end-stackable for expanded displays. Can be cascaded to 10 arrays (100 bargraph elements). LED current programmable from 2mA to 30mA. Stable internal voltage reference for full scale analog inputs from 1.2 to 12V. Each LED output of driver IC with external access. Size: 2"x7/8"x3/16".

NSM3914	Linear Function (10 bars red)	$5.95
NSM39146	Linear Function (6 bars green/4 red)	6.95
NSM3915	Logarithmic Function (10 bars red)	5.95
NSM39158	Logarithmic Func. (6 grn./2 yell./2 rd.)	6.95
NSM3916	VU-Meter Function (10 bars red)	5.95
NSM39168	VU-Meter Func. (6 grn./2 yell./2 rd.)	6.95

DISCRETE LEDS

XC556R	.200"	red	5/$1	MV50	.085"	red	6/$1
XC556G	.200"	green	4/$1	XC209R	.125"	red	5/$1
XC556Y	.200"	yellow	4/$1	XC209G	.125"	green	4/$1
XC556C	.200"	clear	4/$1	XC209Y	.125"	yellow	4/$1
XC22R	.200"	red	5/$1	XC526R	.185"	red	5/$1
XC22G	.200"	green	4/$1	XC526G	.185"	green	4/$1
XC22Y	.200"	yellow	4/$1	XC526Y	.185"	yellow	4/$1
MV10B	.170"	red	4/$1	XC526C	.185"	clear	4/$1

.200(TI¾) Red/Green

Diffused Bi-Color LED

Part No.	1-99	100+
XC5491	.79	.69

XC556 RED LED, METAL MTG. HDW. 2-6'' LEADS.

RL-2 . . $.39 ea. or 3/$1.00

DISPLAY LEDS

C.A. — Common Anode
D.D. — Double Digit
C.C. — Common Cathode
RHD — Right Hand Decimal

Type	Polarity	Ht	Price	Type	Polarity	Ht	Price
MAN 1	C.A.—red	.270	2.95	DLG507	C.A.—green	.500	1.25
MAN 2	5x7 D.M.—red	.300	4.95	DL704	C.C.—red	.300	1.25
MAN 3	C.C.—red	.125	.25	DL707	C.A.—red	.300	1.25
MAN 52	C.A.—green	.300	.99	DL728	C.C.—red	.500	1.49
MAN 54	C.C.—green	.300	.99	DL741	C.A.—red	.600	1.25
MAN 71	C.A.—red	.300	.75	DL747	C.A.—red	.600	1.49
MAN 72	C.A.—red	.300	.75	DL750	C.C.—red	.600	1.49
MAN 74	C.C.—red	.300	1.25	DLO847	C.A.—orange	.800	1.49
MAN 82	C.A.—yellow	.300	.49	DLO850	C.C.—orange	.800	1.49
MAN 84	C.C.—yellow	.300	.99	DL33B	C.C.—red	.110	.35
MAN 3620	C.A.—orange	.300	.49	FND358	C.C. ± 1	.357	.99
MAN 3630	C.A.—orange ± 1	.300	.99	FND357	C.C.	.357	.75
MAN 3640	C.C.—orange	.300	.99	FND500	C.C. (FND503)	.500	.99
MAN 4610	C.A.—orange	.400	.99	FND507	C.A. (FND510)	.500	.99
MAN 6610	C.A.—orange—DD	.560	.99	HDSP-3401	C.A.—red	.800	1.50
MAN 6630	C.A.—orange ± 1	.560	.99	HDSP-3403	C.C.—red	.800	1.50
MAN 6640	C.C.—orange—DD	.560	.99	HDSP-3406	C.C. red ±1	.800	1.50
MAN 6650	C.C.—orange ± 1	.560	.99	5082-7751	C.A., R.H.D.—red	.430	1.25
MAN 6660	C.A.—orange	.560	.99	5082-7760	C.C., R.H.D.—red	.430	1.25
MAN 6710	C.A.—red—DD	.560	.99	5082-7300	4x7 Numeric (RHD)	.600	22.00
MAN 6740	C.C.—red—DD	.560	.99	5082-7302	4x7 Numeric (LHD)	.600	22.00
MAN 6750	C.C.—red ± 1	.560	.99	5082-7340	4x7 Hxdcl. (0-9/A-F)	.600	22.50
DLO304	C.C.—orange	.300	1.25	4N28	Photo Xsistor Opto-Isol.		.69
DLO307	C.A.—orange	.300	1.25	LIT-1	Photo Xsistor Opto-Isol.		.69
DLG500	C.C.—green	.500	1.25	MOC3010	Optically Isol. Triac Driver		1.25

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216-3593	16 pin	9.95	224-3597	24 pin	12.75
218-3594	18 pin	10.95	228-3598	28 pin	13.95
220-3595	20 pin	11.95	240-3599	40 pin	15.95

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14 pin LP	.20	.19	.18
16 pin LP	.22	.21	.20
18 pin LP	.29	.28	.27
20 pin LP	.34	.32	.30
22 pin LP	.37	.36	.35
24 pin LP	.38	.37	.36
28 pin LP	.45	.44	.43
36 pin LP	.60	.59	.58
40 pin LP	.63	.62	.61

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	1-24	25-49	50-100
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16 pin ST	.30	.27	.25
18 pin ST	.35	.32	.30
24 pin ST	.49	.45	.42
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36 pin ST	1.39	1.26	1.15
40 pin ST	1.59	1.45	1.30

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14 pin SG	.49	.45	.41
16 pin SG	.54	.49	.44
18 pin SG	.59	.53	.48
24 pin SG	.79	.75	.69
28 pin SG	1.10	1.00	.90
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40 pin SG	1.75	1.59	1.45

WIRE WRAP SOCKETS (GOLD) LEVEL #3

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16 pin WW	.85	.77	.70
18 pin WW	.99	.90	.81
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100 pf	.08	.06	.05	.022µF	.09	.07	.06
220 pf	.08	.06	.05	.047µF	.09	.07	.06
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3.3/50V	.17	.15	.11	1.0/16V	.15	.13	.12
4.7/25V	.18	.15	.11	1.0/25V	.16	.14	.13
10/25V	.18	.15	.11	1.0/50V	.17	.15	.14
10/50V	.19	.16	.12	4.7/16V	.15	.13	.12
22/25V	.19	.16	.12	4.7/25V	.16	.14	.13
22/50V	.24	.20	.18	4.7/50V	.17	.15	.14
47/25V	.25	.21	.19	10/16V	.15	.13	.12
47/50V	.29	.25	.23	10/25V	.16	.14	.13
100/25V	.28	.24	.22	10/50V	.17	.15	.14
100/50V	.41	.37	.34	47/50V	.25	.21	.19
220/25V	.39	.34	.33	100/16V	.21	.17	.14
220/50V	.49	.45	.41	100/25V	.25	.23	.21
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SN7408N	22	SN7495N	50
SN7410N	18	SN7496N	69
SN7412N	20	SN74122N	39
SN7413N	22	SN74136N	95
SN7414N	29	SN74141N	69
SN7416N	27	SN74151N	65
SN7417N	29	SN74153N	55
SN7420N	17	SN74154N	1.25
SN7425N	20	SN74155N	75
SN7430N	17	SN74157N	58
SN7437N	26	SN74160N	89
SN7438N	24	SN74161N	65
SN7440N	18	SN74163N	85
SN7442N	45	SN74164N	87
SN7443N	42	SN74165N	55
SN7445N	64	SN74174N	88
SN7451N	19	SN74175N	79
SN7454N	19	SN74180N	75
SN7474N	27	SN74181N	1.15
SN7475N	35	SN74393N	1.65

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74LS00	28	74LS158	69
74LS02	28	74LS161	83
74LS03	28	74LS162	89
74LS04	28	74LS163	98
74LS05	22	74LS164	65
74LS08	29	74LS165	65
74LS09	28	74LS169	1.55
74LS10	26	74LS170	1.75
74LS14	89	74LS174	85
74LS20	22	74LS175	85
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74LS26	40	74LS191	1.25
74LS27	27	74LS195	95
74LS28	37	74LS197	78
74LS30	29	74LS221	1.25
74LS32	31	74LS240	1.65
74LS38	31	74LS241	1.65
74LS42	63	74LS243	1.55
74LS48	77	74LS244	1.55
74LS74	38	74LS245	2.45
74LS75	55	74LS251	1.25
74LS86	45	74LS253	85
74LS90	59	74LS257	85
74LS93	65	74LS259	1.95
74LS96	80	74LS260	55
74LS107	43	74LS273	1.55
74LS113	45	74LS279	45
74LS122	45	74LS290	1.25
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74LS125	89	74LS365	85
74LS126	79	74LS367	75
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74LS139	59	74LS374	1.45
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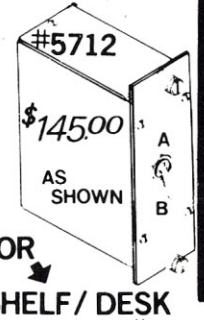

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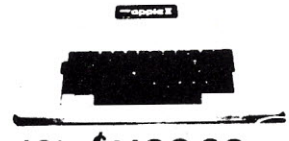

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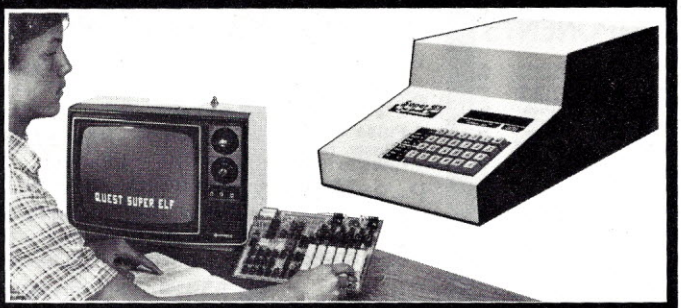

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7445N	.82	LM340K-8	1.35	CD4049	.45
7447N	.63	LM340K-12	1.35	CD4050	.60
7448N	.77	LM340K-15	1.35	CD4051	1.13
7450N	.25	LM340K-24	1.35	CD4060	1.42
7474N	.35	LM340T-5	.85	CD4066	.71
7475N	.49	LM340T-8	.85	CD4068	.40
7485N	.88	LM340T-12	.85	CD4069	.40
7489N	1.70	LM340T-15	.85	CD4070	.50
7490N	.43	LM340T-18	.85	CD4071	.45
7492N	.43	LM340T-24	.85	CD4072	.45
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7495N	.69	LM377	2.95	CD4075	.45
74100N	1.35	LM379	5.00	CD4076	1.45
74107N	.35	LM380N	1.00	CD4078	.40
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74123N	.59	LM382	1.60	CD4082	.35
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74161N	.87	LM748N	.50	CD4515	2.52
74162N	.85	LM1303N	1.75	CD4516	1.10
74163N	.87	LM1304	1.10	CD4518	1.50
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74175N	.85	LM1307	2.00	CD4527	1.51
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74193N	.85	LM1812	7.50	CD4566	2.45
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74LS08N	.35	NE566V	1.50	74C76	1.25
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14	.14	24	.35
16	.16	28	.42
18	.27	36	.58
20	.29	40	.57

2 level 14 pin ww .20

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74C923	5.50
HD0165-5	6.95
AY5-9400	10.50

D Connectors RS232

DB25P	3.62
DB25S	5.20
Cover	1.67
DE9S	1.95
DA15P	2.10
DA15S	3.10
Complete Set	9.50

KEYBOARDS

56 key ASCII keyboard kit	$57.50
Fully assembled	77.50
53 key ASCII keyboard kit	60.00
Fully assembled	70.00
Enclosure Plastic	14.95
Metal Enclosure	29.95

LEDS

Red T01¾	.15
Green, Yellow T01¾	.20
Jumbo Red	.20
Green, Orange, Yellow Jumbo	.25
Cliplite LED Mounting Clips	8/$1.25
(specify red, amber, green, yellow, clear)	

CONTINENTAL SPECIALTIES in stock
Complete line of breadboard test equip.
MAX-100 8 digit Freq. Ctr. $149.95

OK WIRE WRAP TOOLS in stock
Portable Multimeter $18.00
Complete line of AP Products in stock.

SPECIAL PRODUCTS

MM5865 Stopwatch Timer with 10 pg. spec.	9.00
PC board	7.50
Switches Mom. Pushbutton	.27
3 pos. slide	.25
Encoder HD0165-5	6.95
Paratronics	
Model 10 Trigger Expander Kit	$229.00
Model 150 Bus Grabber Kit	$369.00
Clock Calendar Kit	**$23.95**
2.5 MHz Frequency Counter Kit	**$37.50**
30 MHz Frequency Counter Kit	**$47.75**

TRANSFORMERS

6V 300 ma	3.25
12 Volt 2 amp wall plug	7.95
12.6 CT 2 amp	5.95
12.6 CT 4 amp	9.45
12.6 CT 8 amp	12.45
12 BV CT 600 ma	3.75
12V 250 ma wall plug	2.95
12V CT 250 ma wall plug	3.75
24V CT 100 ma	3.95
10V 1.2 amp wall plug	4.85
12V 6 amp	12.95
12V 500 ma wall plug	4.75
12V 1 amp wall plug	6.50
10.15 VAC 8.16 VA wall plug	9.75

DISPLAY LEDS

MAN1	CA	.270	2.90
MAN3	CC	.125	.39
MAN72/74	CA/CA	.300	1.00
DL704	CC	.300	1.25
DL707/DL707R	CA	.300	1.00
DL727/728	CA/CC	.500	1.90
DL747/750	CA/CC	.600	1.95
FND359	CC	.357	.70
FND500/507	CC/CA	.500	1.35
FND503/510	CC/CA	.500	.90
FND800/807	CC/CA	.800	2.20
3 digit Bubble			.60
10 digit display			1.25
7520 Clairex photocells			.39
TIL311 Hex			9.50
MAN3640	CC	.30	1.10
MAN4610	CA	.40	1.20
MAN4640	CC	.40	1.20
MAN4710	CA	.40	.95
MAN4740	CC	.40	1.20
MAN6640	CC	.56	2.95
MAN6710	CA	.60	1.35
MAN6740	CC	.60	1.35

MA1002A, C, E	**8.95**
MA1012A	**8.95**
102P3 transformer	**2.25**
MA1012A Transformer	**2.25**
Televideo Terminal	
Model 912	$785.00
Model 920	$885.00

4116 200ns Dynamic RAM
8/$18.40

RCA Cosmac 1802 Super Elf Computer $106.95

Compare features before you decide to buy any other computer. There is no other computer on the market today that has all the desirable benefits of the **Super Elf** for so little money. The Super Elf is a small single board computer that does many **big** things. It is an excellent computer for training and for learning programming with its machine language and yet it is easily **expanded** with **additional memory, Full Basic, ASCII Keyboards, video character generation, etc.**

Before you buy another small computer, see if it includes the following features: ROM monitor; State and Mode displays; Single step; Optional address displays; Power Supply; Audio Amplifier and Speaker; Fully socketed for all IC's; Real cost of in warranty repairs; Full documentation.

The **Super Elf** includes a **ROM** monitor for program loading, editing and execution with **SINGLE STEP for program debugging** which is not included in others at the same price. With **SINGLE STEP** you can see the microprocessor chip operating with the **unique Quest** address and data bus displays **before, during** and **after** executing instructions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators.

An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a **speaker system** included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key **HEX keyboard** includes 16 HEX keys plus **load, reset, run, wait, input, memory protect, monitor select** and **single step**. Large, on board displays provide output and optional **high and low address**. There is a 44 pin standard connector slot for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for **all** IC's are included in the price plus a detailed 127 pg. instruction manual which now includes over 40 pgs. of software info. including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D.

Remember, other computers only offer Super Elf features at additional cost or not at all. **Compare before you buy. Super Elf Kit $106.95, High address option $8.95, Low address option $9.95. Custom Cabinet** with drilled and labelled plexiglass front panel **$24.95.** All metal Expansion Cabinet, painted and silk screened, with room for 5 S-100 boards and power supply **$57.00. NiCad Battery Memory Saver Kit $6.95.** All kits and options also completely assembled and tested.

Questdata, a software publication for 1802 computer users is available by subscription for $12.00 per 12 issues. Single issues $1.50. Issues 1-12 bound $16.50.

Free 14 page brochure. of complete Super Elf system.

Moews Video Graphics **$3.50.** Games and Music **$3.00**, Chip 8 Interpreter **$5.50.**

Super Expansion Board with Cassette Interface $89.95

This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed.** EPROM can be used for the monitor and Tiny Basic or other purposes. **A IK Super ROM Monitor $19.95** is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50.** A **50 pin connector set** with ribbon cable is available at $15.25 for easy connection between the **Super Elf** and the **Super Expansion Board.**

Power Supply Kit for the complete system (see Multi-volt Power Supply).

Quest Super Basic V5.0

A new enhanced version of **Super Basic** now available. Quest was the first company worldwide to ship a full size Basic for 1802 Systems. A complete function **Super Basic** by **Ron Cenker** including floating point capability with scientific notation (number range $\pm.17E^{38}$), 32 bit integer ± 2 billion; multi dim arrays, string arrays; string manipulation; cassette I/O; save and load, basic, data and machine language programs; and over 75 statements, functions and operations.

New improved faster version including **renumber** and essentially **unlimited variables.** Also, an exclusive user expandable command library.

Serial and Parallel I/O included.

Super Basic on Cassette $55.00.

Type-N-Talk by Votrax

Text to speech synthesizer with unlimited vocabulary, built-in text to speech algorithm, 70 to 100 bits per second speech synthesizer, RS232C interface $345.00.

1802 16K Dynamic RAM Kit $149.00

Expandable to 64K. Hidden refresh w/clocks up to 4 MHz w/no wait states. Addl. 16K RAM **$25.00**

Tiny Basic Extended on Cassette	**$15.00**
(Added commands include Stringy, Array, Cassette I/O etc.) S-100 4-slot expansion	**$ 9.95**
Super Monitor VI.I Source Listing	**$15.00**

Elf II Adapter Kit $24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

Super Color S-100 Video Kit $129.95

Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80 etc. **Dealers: Send for excellent pricing/margin program.**

Editor Assembler	**$25.00**
(Requires minimum of 4K for E/A plus user source)	
1802 Tiny Basic Source listing	**$19.00**
Super Monitor V2.0/2.1 Source Listing	**$20.00**

PROM Eraser

assembled. 25 PROM capacity **$37.50** (with timer **$69.50**). 6 PROM capacity OSHA/UL version **$78.50** (with timer **$108.50**).

Z80 Microcomputer

16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board **$28.50.** Full Kit **$99.00.** Monitor **$20.00.** Power Supply Kit **$35.00. Tiny Basic $30.00**

S-100 Computer Boards

8K Static Godbout Econo IIA Kit	149.00
16K Static Godbout Econo XIV Kit	269.00
24K Static Godbout Econo XX-24 Kit	414.00
32K Static Godbout Econo XX-32 Kit	537.00
16K Dynamic RAM KIt	289.00
32K Dynamic RAM Kit	328.00
64K Dynamic RAM Kit	399.00
Video Interface Kit	**$161.00**
Color Video Kit	129.95

81 IC Update Master Manual $79.95

Comp. IC data selector, 2 vol. master reference guide. Over 51,000 cross references. Free update service through 1981. Domestic postage $4.75.

Modem Kit $60.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included. Bd. Only $17.00. Article in June *Radio Electronics*.

Gremlin Color Video Kit $69.95

32 x 16 alpha/numerics and graphics; up to 8 colors with 6847 chip; 1K RAM at E000. Plugs into Super Elf 44 pin bus. No high res. graphics. On board RF Modulator Kit **$4.95**

NiCad Battery Fixer/Charger Kit

Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions. **$9.95**

Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display, ROM monitor, fully expandable. **$405.00.** 4K version **$450.00.** 4K Assembler **$85.00**, 8K Basic Interpreter **$100.00.**

Special small power supply for AIM65 assem. in frame **$54.00.** Complete AIM65 in thin briefcase with power supply **$499.00.** Molded plastic enclosure to fit both AIM65 and power supply **$47.50.** Special Package Price: 4K AIM, 8K Basic, power supply, cabinet **$625.00.**

AIM65/KIM/VIM/Super Elf 44 pin expansion board; 3 female and 1 male bus. Board plus 3 connectors **$22.95.**

60 Hz Crystal Time Base Kit $4.40

Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

Video Modulator Kit $9.95

Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply

8v 5 amp, ±18v .5 amp, 5v 1.5 amp, −5v .5 amp, 12v .5 amp, −12v option. ±5v, ±12v are regulated. Basic Kit **$35.95.** Kit with chassis and all hardware **$51.95.** Add $5.00 shipping. Kit of hardware **$16.00.** Woodgrain case **$10.00.** $1.50 shipping.

TERMS: $5.00 min. order U.S. Funds. Calif residents add 6% tax. $10.00 min. BankAmericard and Master Charge accepted. $1.00 insurance optional. Postage: Add 5%. C.O.D. $10.00 min. order.

FREE: Send for your copy of our NEW 1981 QUEST CATALOG. Include 48¢ stamp.

Here we grow again !!!

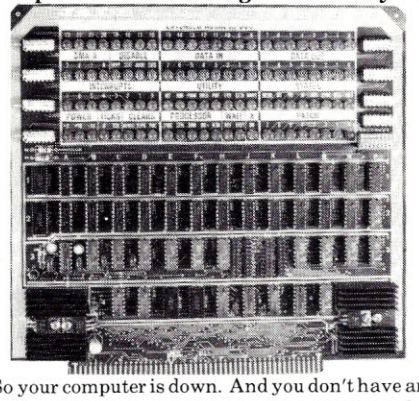
Grand Opening Sale

We're celebrating the latest addition to Jade's Retail Division - our new store located in Woodland Hills at 12800 Ventura Blvd.

New from Jade

The Bus Probe

Inexpensive S-100 Diagnostic Analyzer



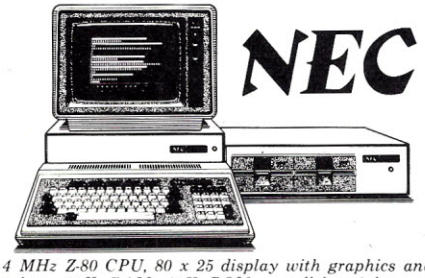
So your computer is down. And you don't have an oscilloscope. And you don't have a front panel... You're not alone - most computers have their occasional bad days. But without diagnostic equipment such as an oscilloscope (expensive!) or a front panel (expensive!), it can be very difficult to pinpoint the problem. Even if you have an extender board with a superfast logic probe, you can't see more than one signal at a time. You're stuck, right?

Not anymore; Jade is proud to offer our cost-effective solution to the problems mentioned above: **THE BUS PROBE.**

Whether you're a hobbyist with a cantankerous kluge or a field technician with an anxious computer owner breathing down your neck, you'll find THE BUS PROBE speeds your repair time remarkably. Just plug in THE BUS PROBE and you'll be able to see *all* the IEEE S-100 signals in action. THE BUS PROBE allows you to see inputs, outputs, memory reads and writes, instruction fetches, DMA channels, vectored interrupts, 8 or 16 bit wide data transfers, plus the three bus supply voltages.

An on-board pulse generator can provide repetitive resets, interrupts, or wait states, for trouble shooting.

TSX-200B *Bare board* **$59.95**
TSX-200K *Kit* **$119.95**
TSX-200A *A&T* **$149.95**



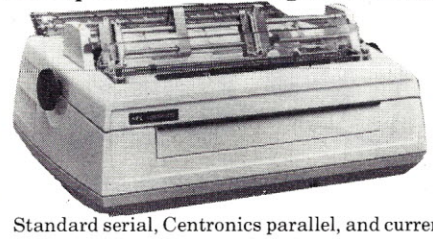
4 MHz Z-80 CPU, 80 x 25 display with graphics and 8 colors, 32K RAM, 24K ROM, parallel/serial/cassette interfaces, upper/lower case, numeric keypad, 10 special function keys, uses CP/M 2.2.

NEC-8001A *32K CPU/keyboard* .. **$1095.00**
NEC-8012A *I/O with 32K RAM* ... **$695.00**
NEC-8031A *Dual disk unit* **$1095.00**
VDM-651200 *12" green CRT* **$269.95**
NEC-1202D *Hi-res RGB color CRT* **$1045.00**
VDC-651212 *12" color monitor* **$479.95**
NEC-9010S *CP/M 2.2 for NEC* **$150.00**
NEC-90005 *Gen. accting softwr* ... **$375.00**

Intersell

Sellum I

NEC Spinwriter w/ Intelligent Controller



Standard serial, Centronics parallel, and current loop interfaces • Selectable baud rates 50 to 19,200 • Automatic bidirectional printing • Logic seeking • 650 character buffer with optional 16K buffer • 55 characters per second print speed • Comes with vertical forms tractor, ribbon, thimble and cable • Diablo compatible software • Available with or without optional front panel

PRD-55511 *1K no front panel* **$2795.00**
PRD-55512 *16K no front panel* ... **$2895.00**
PRD-55515 *1K w/front panel* **$2995.00**
PRD-55516 *16K w/front panel* ... **$3095.00**

Intersell NEC 3500Q

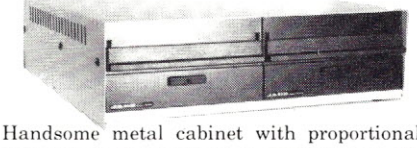
Intersell has announced that, available in September, they will offer a version of the new NEC Model 3500Q Spinwriter (30 cps) that will bring to the customer the same standard features as the Sellum I (except the tractor assembly which is optional on the 3500Q) but incorporating the added features of the NEC Model 3500Q

PRD-55351 *3500Q 1K* **$1995.00**
PRD-55352 *3500Q 16K* **$2095.00**
PRA-55100 *Deluxe tractor option* .. **$300.00**

JADE

Disk Sub-Systems

Shugart, Siemens, Qume



Handsome metal cabinet with proportionally balanced air flow system • Rugged dual drive power supply • Power cable kit • Power switch, line cord, fuse holder, cooling fan • Never-Mar rubber feet • All necessary hardware to mount 2-8" disk drives, power supply, and fan • Does not include signal cable

Dual 8" Subassembly Cabinet

END-000420 *Bare cabinet* **$59.95**
END-000421 *Cabinet kit* **$225.00**
END-000431 *A & T* **$359.95**

8" Disk Drive Subsystems
Single Sided, Double Density

END-000423 *Kit w/2 FD100-8Ds* . **$924.95**
END-000424 *A & T w/2 FD100-8Ds* **$1124.95**
END-000433 *Kit w/2 SA-801Rs* ... **$999.95**
END-000434 *A & T w/2 SA-801Rs* **$1195.00**

8" Disk Drive Subsystems
Double Sided, Double Density

END-000426 *Kit w/2 DT-8s* **$1224.95**
END-000427 *A & T w/2 DT-8s* ... **$1424.95**
END-000436 *Kit w/2 SA-851Rs* .. **$1495.00**
END-000437 *A & T w/2 SA-851Rs* **$1695.00**

-Special Sale Price-

QUME DT-8

8" Double-Sided, Double-Density Disk Drive

1 Drive ... $524.95 each
2 Drives . $499.95 each
10 Drives $479.95 each

Jade Part Number MSF-750080

SIEMENS 8"

8" Single-Sided, Double-Density Disk Drive

1 Drive ... $384.95 each
2 Drives . $349.95 each
10 Drives $324.95 each

Jade Part Number MSF-201120

Shugart 801R

8" Single-Sided, Double-Density Disk Drive

1 Drive ... $394.95 each
2 Drives . $389.95 each

Jade Part Number MSF-10801R

MPI B-51

5¼" Single-Sided, Double-Density Disk Drive

1 Drive ... $234.95 each
2 Drives . $224.95 each
10 Drives $219.95 each

Jade Part Number MSM-155100

END-000213 *Case & power supply* **$74.95**

Micro-Sci

Apple Disk Drives

Increased Capacity - Decreased Price

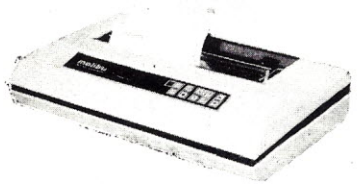
40 or 70 track drives • operates with DOS 3.2 and 3.3, Language System, and the Z80 Softcard • 40 and 70 track drives may be mixed on your Apple II • With two 40 track drives you get a 12.5% increase in capacity, 300% improvement in track-to-track access, and save about 15% • With two 70 track drives instead of four 35 track drives you get the same capacity, 300% improvement in track-to-track access time, and save about 45%.

IOD-2340A *A-40 with cable* **$399.95**
IOD-2370A *A-70 with cable* **$529.95**
IOD-2300A *Micro-sci controller* **$89.95**

Grand Opening Sale

★★★★★★ San Diego ★★★★★★ Hawthorne ★★★★★★ Woodland Hills ★★★★★★

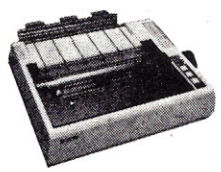
Printers



Dual-Mode 200 - Malibu

200 CPS/9 x 9 matrix or 70 CPS/19 x 18 matrix for letter quality, stores up to 12 different fonts, hi-res dot graphics, single sheet and tractor feed, RS-232C and parallel interfaces

PRM-35200 *Dual-Mode 200* **$2695.00**



BEST BUY in PRINTERS - Epson

MX-70 *132 column, 80 CPS, 5 x 7 dot matrix, adjustable tractor feed, & graphics*

PRM-27070 *List $459* **$399.95**

MX-80 *132 column, 80 CPS, bi-directional/logic seeking printing, 9 x 9 dot matrix, adjustable tractor feed, & 64 graphics characters*

PRM-27080 *List $645* **$474.95**

MX-80FT *same as MX-80 with friction feed*

PRM-27082 *List $745* **$574.95**

MX-100 *233 column, correspondence quality, ultra-high resolution graphics, up to 15" paper, friction feed & removable/adjustable tractor feed, 18 x18 dot matrix, 80 CPS, programmable forms handling*

PRM-27100 *List $945* **$795.00**

PRA-27084 *Serial interface* **$69.95**
PRA-27088 *Serial intf & 2K buffer* .. **$144.95**
PRA-27081 *Apple card* **$74.95**
PRA-27082 *Apple cable* **$22.95**
PRA-27086 *IEEE 488 card* **$52.95**
PRA-27087 *TRS-80 cable* **$32.95**
PRA-27085 *Graftrax II* **$95.00**
PRA-27083 *Extra ribbon* **$14.95**

Accessories for TRS-80

DISK DRIVES for TRS-80

23% more storage, 8 times faster, 40 track with free patch, 120 day warranty.

MSM-12410C *Save $125.00 !!!* **$325.00**

8" DISK DRIVES for MODEL II

2 double density drives with cabinet, power supply, & cables

END-000433 *Kit* **$1050.00**
END-000434 *Assembled* **$1250.00**
WCA-5036A *Cable (required)* **$29.95**

16K Atari . . . $359.95

ATARI 800 - Atari

Complete personal computer with high resolution color graphics, built-in RF modulator, 4 controller ports, internal speaker, 16K RAM & 8K ROM

SYO-2080A *16K Atari 800* **$759.95**
Atari 800 with 32K of RAM **$799.95**
Atari 800 with 48K of RAM **$849.95**
SYO-2040A *16K Atari 400* **$359.95**
MSM-330810 *Disk drive* **$595.00**
MSM-330815 *Dual drive* **$1395.00**
IOX-5050A *850 interface* **$199.95**
MEX-16853K *16K RAM module* **$69.95**
SFI-241011005 *Visicalc* **$184.95**

Accessories for Apple

16K MEMORY UPGRADE

Add 16K of RAM to your TRS-80, Apple, or Exidy in just minutes. We've sold thousands of these 16K RAM upgrades which include the appropriate memory chips (as specified by the manufacturer), all necessary jumper blocks, fool-proof instructions, and our 1 year guarantee.

MEX-16100K *TRS-80 kit* **$25.00**
MEX-16101K *Apple kit* **$25.00**
MEX-16102K *Exidy kit* **$25.00**

16K RAM Card - Microsoft

(There is life after 48K)

MEX-16300A *A & T* **$174.95**

Z-80* CARD for APPLE

Two computers in one, Z-80 & 6502, more than doubles the power & potential of your Apple, includes Z-80 CPU card, CP/M 2.2, & BASIC-80*

CPX-30800A *A & T* **$299.95**

APPLE CLOCK - Cal Comp Sys

Real time clock w/battery back-up

IOK-2030A *A & T* **$109.95**

8" DISK CONTROLLER

New from Vista Computer, single or double sided, single or double density, compatible with DOS 3.2/3.3, Pascal, & CPM 2.2, Shugart & Qume compatible

IOD-2700A *A & T* **$499.95**

8" DRIVES for APPLE

Controller, DOS, two 8" double densisty drives, cabinet, power supply, & cables

Special Package Price *Kit* **$1399.95**

PRINTER INTERFACE - C.C.S.

Centronics type I/O card w/ firmware

IOI-2041A *A & T* **$99.95**

AIO, ASIO, APIO - S.S.M.

Parallel & serial interface for your Apple (see Byte pg 11)

IOI-2050K *Par & Ser kit* **$139.95**
IOI-2050A *Par & Ser A & T* **$169.95**
IOI-2052K *Serial kit* **$89.95**
IOI-2052A *Serial A & T* **$99.95**
IOI-2054K *Parallel kit* **$69.95**
IOI-2054A *Parallel A & T* **$89.95**

A488 - S.S.M.

IEEE 488 controller, uses simple basic commands, includes firmware and cable, 1 year guarantee, (see April Byte pg 11)

IOX-7488A *A & T* **$399.95**

CPS MULTICARD - Mtn. Computer

Three cards in one! Real time clock/calendar, serial interface, & parallel interface - all on one card.

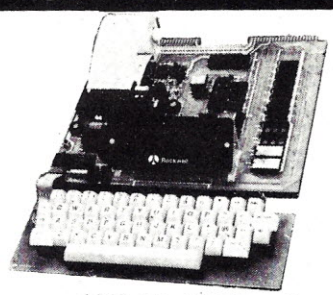
IOX-2300A *A & T* **$199.95**

Apple-CAT - Novation

Software selectable 1200 or 300 baud, direct connect, auto-answer/auto-dial, auxiliary 3-wire RS232C serial port for printer.

IOM-5232A *Save $50.00!!!* **$325.00**

Single Board Computers



AIM-65 - Rockwell

6502 computer with alphanumeric display, printer, & keyboard, and complete instructional manuals

CPK-50165 *1K AIM* **$424.95**
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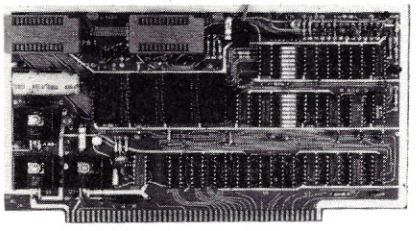

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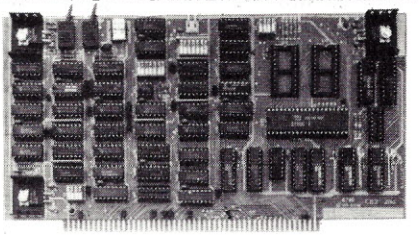

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LETTERS

(from page 38)

Anyone who has been reading the numerous articles and advertisements for the Motorola 68000 is aware that this is by far the fastest of the available microprocessor chips. I am not trying to say that the 6809 is not overall a better general-purpose computing device than the 6502. I *am* saying that for a chip which came along five years later than the 6502 the relative performance advantage seems slight.

I believe the 68000, not the 6809, is the logical successor to the 6502. After all, the 6502 was noted for being significantly faster than the other microprocessor chips of its day. On the other hand, the 6809 bears the dubious distinction of being unquestionably the slowest microprocessor of its generation, while the 68000 is the fastest. Like the original 6502, very simple yet useful systems can be built using the 68000. The 68000 even has a zero page addressing mode which, like the 6502, operates significantly faster and uses less memory space than the longer forms of addressing. Further, the zero page in the 68000 is 64K bytes wide.

The currently high price of the 68000 is a temporary inconvenience which will surely be cured as a number of second sources come on line. The 68000 has been available from Hitachi for some time now, and Rockwell will be selling parts shortly.

I would be very interested to hear of other persons' experiences with the 68000, and I am willing to exchange software and other information on the 68000 with anyone who does not plan to compete with us by manufacturing environmental noise monitors!

Hal W. Hardenbergh
President, Digital Acoustics, Inc.
1415 E. McFadden, Suite F
Santa Ana, CA 92705

Kudos

I am writing to thank you for the series of articles by Peter Stark on the 6800 (now 68xx) series. I realize that you don't have much use for the SS-50 bus machines, but there are a few of us out here, and we do appreciate whatever coverage we get. Pete's articles are both interesting and useful. I feel I'd be getting my money's worth for his articles alone, and indeed as long as he continues to write, you'll have me as a subscriber.

The June issue of *Microcomputing* contained an especially useful article, presented by Pete, but written by others (G. Caudell, R. Silver, "Thoughts on the 68xx System" p. 136). I was able to get the editing program working on my TSC Editor program with very little trouble. But unfortunately, the program supplied for the BASIC interpreters wouldn't work with my version of SWTP 8K BASIC (V2.3). The V2.3 has a different location for all of the routines used in the Editor. Since I figure that there may be several others out there with V2.3, I thought it might be useful to pass along the program I adapted to work with my BASIC. It's exactly the same as the program written by Mr. Silver and/or Mr. Caudell, except that the routines in BASIC refer to the locations in SWTP 8K BASIC V2.3. (See Listing 1.)

Charlie Hoffpauir
Alvin, TX

I want to let you know how much I enjoyed the July issue of *Microcomputing*. The article by Tom Jorgenson ("Dissecting the HDOS Diskette," p.66) was well researched and interesting even to a businessman with a Zenith version of the Heath 89. Eric Maloney's article on health hazards was informative and pro-

Listing 1. SWTP V2.3 editing program.

```
00010                          NAM     BASED    BASic EDitor
00020                  *               6/29/81
00030                          OPT     O
00040 B000                     ORG     $B000
00050                  * BASIC ENTRY POINTS
00060        0024      BUFPNT EQU     $24
00070        002C      MEMPNT EQU     $2C
00080        004A      COUNTR EQU     $4A
00090        00AC      TEMP   EQU     $AC
00100        00B0      BUFFER EQU     $B0       BEGINNING OF THE BASIC BUFFER
00110        00F8      BUFEND EQU     $F8       END OF BUFFER
00120        03BB      OUTC   EQU     $03BB
00130        03CA      INPUTC EQU     $03CA
00140        04A8      BERROR EQU     $04A8
00150        04BB      PLINEC EQU     $04BB
00160        04CF      PSTR   EQU     $04CF
00170        04ED      PSHX   EQU     $04ED
00180        0502      PULX   EQU     $0502
00190        0AEF      LINEC  EQU     $0AEF
00200        0B27      BERR2  EQU     $0B27
00210        0B32      NUMC   EQU     $0B32
00220                  *  MISC. CONSTANTS
00230        0008      BACK   EQU     $08       BACK SPACE CHARACTER
00240        0009      TAB    EQU     $09       FORWARD SPACE CHARACTER
00250                  *
00260 B000 4D          PATCH  TST A
00270 B001 26 03               BNE     CONTP1
00280 B003 7E 0474             JMP     $0474     JUMP BACK TO REG. CODE
00290 B006 81 05       CONTP1  CMP A   #$05      CHECK FOR CONTROL "E"
00300 B008 27 03               BEQ     EDIT      ENABLE EDIT FEATURES
00310 B00A 7E 047A             JMP     $047A     BACK TO REG. CODE
00320                  *
00330 B00D BD 04ED     EDIT    JSR     PSHX
00340 B010 6F 00       CLEAR   CLR     ,X        CLEAR BUFFER TO END
00350 B012 08                  INX
00360 B013 8C 00F8             CPX     #BUFEND   IS IT THE END OF THE BUFFER?
00370 B016 26 F8               BNE     CLEAR
00380 B018 BD 0502             JSR     PULX
00390 B01B BD 03CA     INPUT   JSR     INPUTC    INPUT LOOP
00400 B01E 81 0D               CMP A   #$0D      CHECK FOR CARRIAGE RETURN
00410 B020 26 03               BNE     CONT1
00420 B022 7E B11B             JMP     ENDRTN    IF SO JUMP BACK TO BASIC
00430 B025 81 08       CONT1   CMP A   #BACK     CHECK FOR BACKSPACE
00440 B027 27 2D               BEQ     BACKSP
00450 B029 81 09               CMP A   #TAB
00460 B02B 27 15               BEQ     FORWAR
00470 B02D 81 04               CMP A   #$04      CONTROL D
00480 B02F 27 34               BEQ     DELETE
00490 B031 81 01               CMP A   #$01      CONTROL A
00500 B033 27 5D               BEQ     ADD
00510 B035 81 12               CMP A   #$12      CONTROL R
00520 B037 26 03               BNE     CONT3
00530 B039 7E B0B0             JMP     RECALL
00540 B03C 81 1F       CONT3   CMP A   #$1F      CHECK IF CONTROL CHARACTER
00550 B03E 2B DB               BMI     INPUT     IF SO, IGNORE
00560 B040 A7 00       STORCH  STA A   ,X        STORE CHARACTER IN BUFFER
00570                  * MOVE CURSOR FORWARD
00580 B042 A6 00       FORWAR  LDA A   ,X
00590                  * CHECK IF AT END OF LINE IN BUFFER
00600 B044 26 07               BNE     CONT2
00610 B046 96 08               LDA A   BACK
00620                  * PUT CURSOR BACK WHERE IT BELONGS
00630 B048 BD 03BB             JSR     OUTC
00640                  *
00650 B04B 20 CE               BRA     INPUT
00660                  * MOVE TO NEXT POSITION IN BUFFER
00670 B04D 08          CONT2   INX
00680 B04E 8C 00F8             CPX     #BUFEND   CHECK FOR END OF BUFFER
00690 B051 26 C8               BNE     INPUT
00700 B053 7E 04A8     ERROR   JMP     BERROR
00710                  * BACK UP CURSOR
```

More

Listing 1 continued.

```
00720 B056 8C 00B0 BACKSP CPX     #BUFFER  CHECK IF AT START OF BUFFER
00730 B059 27 03          BEQ     ATBEG    BRA IF SO
00740 B05B 09             DEX
00750 B05C 20 BD    LOOPBA BRA    INPUT
00760 B05E 86 09    ATBEG  LDA A  #TAB     MOVE CURSOR FORWARD
00770 B060 BD 03BB         JSR    OUTC
00780 B063 20 B6           BRA    INPUT
00790              *
00800              *  DELETE A CHARACTER FROM BUFFER AND CRT
00810 B065 BD 04ED DELETE JSR     PSHX
00820              *  ZERO COUNTER IN ORDER TO REPOSITION CURSOR
00830 B068 7F 004A         CLR    COUNTR
00840              *  MOVE CURSOR AND BUFFER CONT. ONE POS, LEFT
00850 B06B A6 01    MOVELF LDA A  1,X
00860 B06D BD 03BB         JSR    OUTC
00870 B070 A7 00           STA A  X
00880 B072 08              INX
00890 B073 7C 004A         INC    COUNTR   COUNT CHARACTERS TO END
00900 B076 4D              TST A
00910 B077 26 F2           BNE    MOVELFT
00920 B079 86 20    SPACE  LDA A  #$20     PRINT SPACE
00930 B07B BD 03BB         JSR    OUTC
00940              *  PUT CURSOR BACK TO CORRECT POSITION
00950 B07E 7D 004A MOVECS TST     COUNTR   CHECK TO SEE IF FINISHED
00960 B081 27 0A           BEQ    ENDD
00970 B083 86 08           LDA A  #BACK
00980 B085 BD 03BB         JSR    OUTC
00990 B088 7A 004A         DEC    COUNTR
01000 B08B 20 F1           BRA    MOVECS
01010 B08D BD 0502 ENDD    JSR    PULX
01020 B090 20 CA           BRA    LOOPBACK
01030 B092 BD 04ED ADD     JSR    PSHX
01040              *  ADD SPACE TO BUFFER AT CURSOR POSITION
01050 B095 7F 004A         CLR    COUNTR   ZERO COUNTER
01060 B098 C6 20           LDA B  #$20     PUT SPACE IN BUFFER
01070              *  MOVE CURSOR AND BUFFER RIGHT ONE PLACE
01080 B09A 17       MOVERT TBA
01090 B09B E6 00           LDA B  X
01100 B09D A7 00           STA A  X
01110 B09F BD 03BB         JSR    OUTC
01120 B0A2 08              INX
01130 B0A3 8C 00F8         CPX    #BUFEND  CHECK FOR FILLED BUFFER
01140 B0A6 27 AB           BEQ    ERROR
01150 B0A8 7C 004A         INC    COUNTR   COUNT CHARACTERS FILLED
01160 B0AB 4D              TST A
01170 B0AC 26 EC           BNE    MOVERT
01180 B0AE 20 C9           BRA    SPACE
01190              *
01200              *  RECALL LINE FROM MEMORY & PLACE IN BUFFER
01210 B0B0 8D 5B    RECALL BSR    ZERCSR   MOVE CURSOR TO START OF LINE
01220 B0B2 CE 00B0         LDX    #BUFFER  FIND LINE NUMBER IN BUFFER
01230 B0B5 BD 0B32         JSR    NUMC     CONVERT TO BCD FOR LINEC
01240 B0B8 24 03           BCC    CONT4    INVALID LINE NUMBER?
01250 B0BA 7E 0B27 ERR2    JMP    BERR2
01260              *  STORE POSITION OF END OF LINE NUMBER
01270 B0BD DF 24    CONT4  STX    BUFPNT
01280 B0BF BD 0AEF         JSR    LINEC    FIND LINE IN MEMORY
01290 B0C2 25 F6           BCS    ERR2     BRANCH IF NOT FOUND
01300              *  SKIP PAST LINE NUMBER STORED IN MEMORY
01310 B0C4 08              INX
01320 B0C5 08              INX
01330              *  STORE POSITION OF LINE IN MEMORY
01340 B0C6 DF 2C           STX    MEMPNT
01350 B0C8 8D 1F           BSR    STORKY   STORE KEYWORD IN BUFFER
01360 B0CA 08              INX
01370              *  TRANSFER CHARACTERS FROM MEMORY TO BUFFER
01380 B0CB A6 00    SLOOP  LDA A  X
01390 B0CD 4D              TST A
01400              *  BRANCH IF LAST CHARACTER IN LINE
01410 B0CE 27 0A           BEQ    ENDR
01420 B0D0 81 19           CMP A  #$19     ANOTHER KEYWORD?
01430 B0D2 2C 04           BGE    STRCHR   BRANCH IF NOT
01440 B0D4 8D 13           BSR    STORKY   STORE KEYWORD IN BUFFER
01450 B0D6 20 F3           BRA    SLOOP
01460 B0D8 8D 1C    STRCHR BSR    TRNSFR+2 STORE CHARACTER IN BUFFER
01470 B0DA DE 24    ENDR   LDX    BUFPNT   STORE $00 IN BUFFER
01480 B0DC A7 00           STA A  X
01490 B0DE CE 00B0         LDX    #BUFFER  PRINT CONTENTS OF THE BUFFER
01500 B0E1 BD 04CF         JSR    PSTR
01510              *  SET INDEX TO LAST CHARACTER IN BUFFER
01520 B0E4 DE 24           LDX    BUFPNT
01530 B0E6 7E B01B         JMP    INPUT
01540 B0E9 EE 00    STORKY LDX    X        STORE KEYWORK IN BUFFER
01550 B0EB 09              DEX
01560 B0EC 09       BACKUP DEX              LOCATE KEYWORK IN TABLE
01570 B0ED A6 00           LDA A  X
01580 B0EF 26 FB           BNE    BACKUP
01590              *  SKIP PAST JUMP ADDRESS IN TABLE
01600 B0F1 08              INX
01610 B0F2 08              INX
01620 B0F3 08              INX
01630 B0F4 A6 00    TRNSFR LDA A  X        TRANSFER CHARACTERS TO BUFFER
01640 B0F6 81 20           CMP A  #32      LAST CHARACTER OR KEYWORD?
01650 B0F8 2D 0E           BLT    ENDSTR   BRANCH IF SO
01660 B0FA 08              INX
```

More →

vocative. Dr. Wolfe's discussion of ionizing radiation was accurate as far as it went, but I wish he would have gone further with millirems and biological burdens.

I intend to use large portions of both video health articles in training material for our radioassay instrument technicians.

R.C. Thompson
Houston, TX

Dear Sexists

I note that you are requesting papers from businessmen. When will there be a similar request for articles from businesswomen?

Fifty years ago the only persons who could do business were male, and businessmen and the salutation gentlemen made some kind of sense.

That milieu, I sincerely hope, is passing forever, and I, for one, have little tolerance for its perpetuation, even when, as I suspect in your case, it is inadvertent.

O.M. Mani
Rancocas, NJ

Dear anti-sexist:

If you feel so strongly about this, we suggest you change churches (see Fig. 1), or at least change the return address on your stationery.—Editors.

Sales Software

I am an Amway distributor looking for a distributor software package for the Apple II+ computer. If anyone can help, I certainly would appreciate it.

Cook Clark Enterprises
PO Box 12482
Jackson, MS 39211

Cubbing by Computer

Has anyone made use of the Apple computer for a Cub Scout Pinewood Derby? Our pack uses a four-line track which has an electronic judge to show the order of finish.

CHURCH OF THE COMPLETED MAN
POST OFFICE BOX 119
RANCOCAS, NEW JERSEY 08073

Fig. 1.

I would like to interface this to an Apple and have a program to list the scout names, den number, car number and final order of finish for each den and first, second and third place finishers for the pack.

If anyone has done something like this or has any ideas to share on how to do it, I would appreciate hearing from him.

George Cook
410 Spruce St.
Carlinville, IL 62626

DSC-2 Documentation

In mid-March, I purchased a Digital Microsystems DSC-2 at a bankruptcy auction. The system has an ADM-3A terminal and a TI 810 line printer.

I would like to correspond with any readers who have information about DSC-2 systems to determine what documentation is around besides the user's manual and the logic diagnostic program.

N.C. Helmkay
PO Box 446
Milliken, Ontario L0H-1K0
Canada

Listing 1 continued.

```
01670 B0FB DF AC          STX     TEMP
01680 B0FD DE 24          LDX     BUFPNT   PICK UP BUFFER INDEX
01690 B0FF A7 00          STA A   X
01700 B101 08             INX
01710 B102 DF 24          STX     BUFPNT
01720 B104 DE AC          LDX     TEMP
01730 B106 20 EC          BRA     TRNSFR
01740                *  LOAD POSITION OF BUFFER AFTER LINE #
01750 B108 DE 2C    ENDSTR LDX    MEMPNT
01760                *  LOAD POSITION OF BUFFER AFTER LINE #
01770 B10A 08             INX
01780 B10B 08             INX
01790 B10C 39             RTS
01800 B10D 8C 00B0 ZERCSR CPX     #BUFFER  AT BEGINNING OF BUFFER?
01810 B110 27 08          BEQ     ENDZ     BRANCH IF YES
01820 B112 86 08          LDA A   #BACK
01830 B114 BD 03BB        JSR     OUTC
01840 B117 09             DEX
01850 B118 20 F3          BRA     ZERCSR
01860 B11A 39       ENDZ  RTS
01870                *
01880 B11B CE 00AF  ENDRTN LDX    #BUFFER-1  FIND END OF LINE IN BUFFER
01890 B11E 08       LOOP  INX
01900 B11F A6 00          LDA A   X
01910 B121 4D             TST A
01920 B122 26 FA          BNE     LOOP
01930 B124 7E 04BB        JMP     PLINEC
01940       B127    PRGEND EQU    *
01950                *
01960                *  PATCHES TO BASIC  *
01970                *
01980 0477                ORG     $0477
01990                *
02000 0477 7E B000        JMP     PATCH    PATCH TO CHECK FOR CONTROL-E
02010                *
02020                     END
```

A Tragic Story

We regret to inform you that after some time of successful operation, The Bottom Shelf, Inc., is no longer in business.

Some of you are familiar with the immediate cause of the failure. Having developed a number of applications for the Radio Shack Model I microcomputer, TBS was happy to hear in August of last year of the release of the Model III, a considerable upgrade. Because of difficulties with the FCC, Radio Shack discontinued the Model I. Unfortunately for us, however, the TRSDOS operating system for the Model III had major flaws and was not capable of supporting the sophisticated programming of TBS. Radio Shack, to this day, has not corrected the problems. The dealer orders declined sharply upon discovery of this, being unwilling to stock software which would not run on any currently sold computer.

The officers and staff of TBS did their best to keep going until Radio Shack fulfilled their obligation to supply a proper operating system. Time ran out on us, and the doors have now been closed.

To those of you who have trusted us with credit, we are the most regretful. All the computer gear was pledged and is now in the hands of the secured creditor; the landlord has filed a lien on the few remaining assets. Nothing remains for distribution to general creditors.

No bankruptcy action will be filed by TBS since there are no assets and the corporation is simply being abandoned.

The Bottom Shelf, Inc.
Atlanta, GA

Edited by Linda Stephenson

Personal Computer from IBM
Add-on Drives for Heath
Apple II 64K RAM
Graphics for TI Terminal

IBM Enters the Field

IBM has entered the microcomputer business with the announcement of the IBM Personal Computer, a machine designed for business, school and home use. Standard equipment includes a detachable 83-key keyboard, a cassette tape jack, five expansion slots for peripherals, built-in speaker for music programming, automatic self-test of components after power-on, an enhanced version of Microsoft BASIC, 16K bytes of user memory and a high-speed 16-bit microprocessor.

The system can support two 5-1/4-inch disk drives, and memory is expandable up to 256 bytes. An optional monitor or a television with rf modulator provides a display of 25 lines of 80 characters per line. Available software includes a disk operating system, Pascal compiler, CP/M and the UCSD P-system. Applications programs include VisiCalc, general ledger, A/R, A/P, a word processor, Microsoft Adventure and communications software to use the optional RS-232C asynchronous adapter. Prices range from $1565 to $6300, depending on equipment options.

International Business Machines Corporation, Information Systems Division, Entry Systems Business, PO Box 1328, Boca Raton, FL 33432. Reader Service number 492.

Video Display Monitor

A low-cost 12-inch video monitor for microcomputers is being offered by Zenith Data Systems, 1000 Milwaukee Ave., Glenview, IL 60025. The ZVM-121 monitor displays an 8 × 10 character matrix and up to 24 lines on its green screen. It is switch-selectable for 40- or 80-character display. The monitor is compatible in styling, size and color with the Apple II and Apple III, and is small enough to sit on top of most other microcomputers. Exterior controls include power, black level, contrast, horizontal and vertical adjustment and vertical size adjustment. The monitor weighs about 14 pounds. Reader Service number 486.

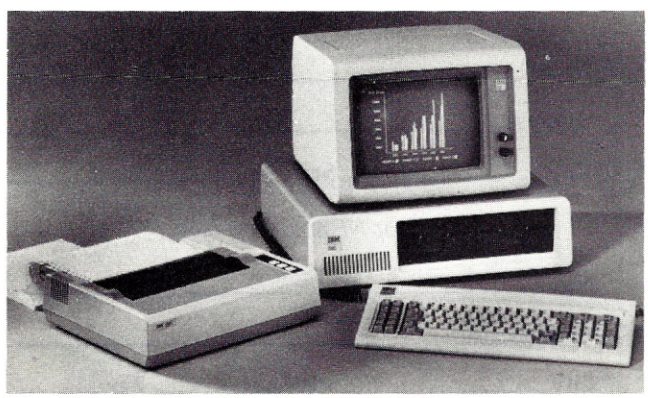
Percom Making H-89, H-8 Drives

Add-on drives for Heath H-89 and H-8 computers are now available from Percom Data Company, Inc., 211 N. Kirby, Garland, TX 75042. Both 40- and 80-track versions can be ordered in either one- or two-drive modules. Forty-track Z drives work with all H-89/H-8 software; 80-track units support HDOS programs after making a minor change to the Heath disk operating system. Percom provides an HDOS modification patch on disk with 80-track units. An optional cable for hooking the drives to the computer is available from Percom. Percom add-on Z drives start at $399 for assembled, tested and burned-in units. Reader Service number 485.

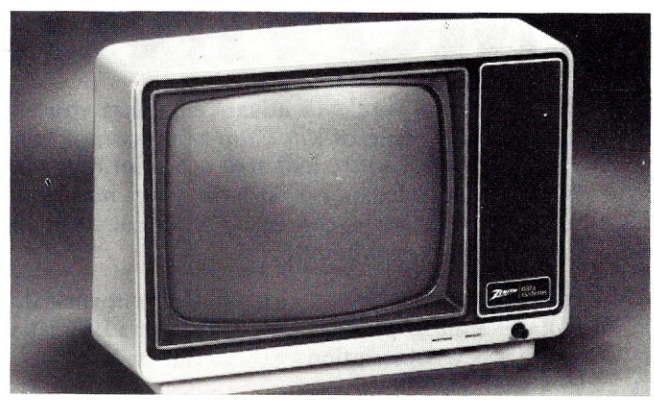
Moveable Labeling For Micro Data Cartridges

Micro tape cartridges are often used to back up files on the new Winchester disk drives. The repeated dumping of updated files to the tape cartridges could cause a labeling headache—writing, then crossing out, rewriting, peeling and reapplying gummed standard labels. The job can be simplified with tiny, moveable Slap-Tags. Using hook and loop fasteners, the 5/8-inch × 1-1/2-inch vinyl label holders move back and forth between cartridges to reflect the latest run status without rewriting entries. They are $12 per dozen sets.

Hexco, Inc., Box 199, Hunt,



IBM's Personal Computer, with optional printer and video display monitor.



Zenith Data Systems' Model ZVM-121 12-inch monochrome video monitor.

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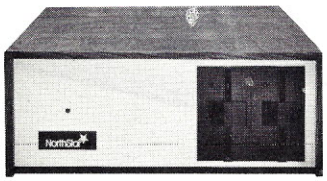

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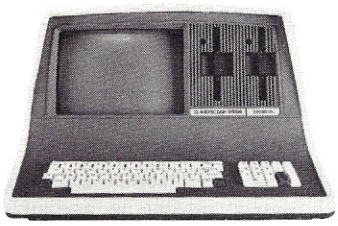

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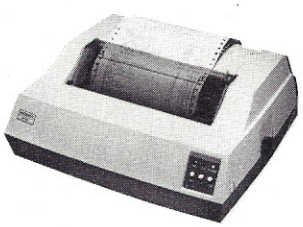

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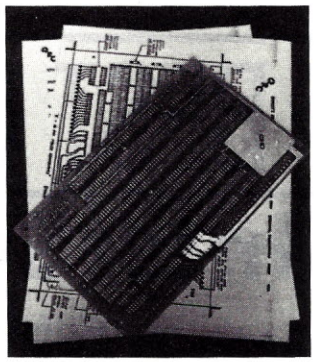
TX 78024. Reader Service number 496.

Prototype Design Card: QRC 81-230

A new S-50 prototype card from Quality Research Company, PO Box 7207, Spokane, WA 99207, can simplify construction of electronic circuits for on-line use with computer systems. The prototype card provides several wire-wrap and/or hardwire connection points for each of the data, control and power-supply bus lines. A voltage regulator pattern can provide for on-card power to various TO-3 and TO-220 devices. Filter and bypass capacitor patterns permit capacitor installation at several card locations. Provision is made along the top edge of the card for an easily-accessible 12-pin molex connector and standard 25-pin D-type connector. A ribbon cable header connector can also be used.

The double-sided card with plated through-holes is compatible with all S-50 products. The bare card and instructions are priced at $18.50. Molex bus connectors optional. Reader Service number 497.



Quality Research Company's S-50 prototype card.

64K RAM Card for The Apple II

Legend Industries, Ltd., PO Box 112, Pontiac, MI 48056, announces its 64K byte RAM card for the Apple II computer. The card uses Texas Instruments' TMs4164 RAM chips. The board gives the Apple the ability to access double its own RAM space by bank switching 16K banks of RAM over the Apple's existing ROM space. It is fully compatible with the Apple language card. Price is $349. Reader Service number 484.

Digital Engineering's Retro-Graphics enhancement package brings full graphics capability to the TI OPTI 900 Model 940.

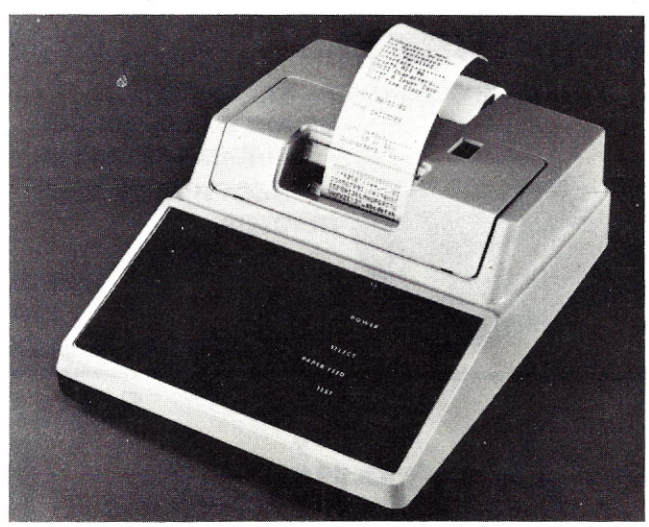
TI Terminal Gets Full Graphics Capability

The Retro-Graphics enhancement package for TI OPTI 900 Model 940 converts the display terminal from alphanumerics to full graphics capability, including point plots, pie and bar charts and complex mappings and curves. Other features include area fill, selective erase, an enhanced text mode and an interactive cross-hair cursor. The Retro-Graphics printed-circuit board fits neatly within TI's Model 940, and comes with all the necessary connectors and accessory hardware to complete the retrofit. Price is $1400.

Digital Engineering, Inc., 630 Bercut Drive, Sacramento, CA 95814. Reader Service number 499.

Hard Copy from Your Apple

An Apple II-compatible dot matrix printer is available from Addmaster Corporation, 416 Junipero Serra Drive, San Gabriel, CA 91776. The Model 170 parallel interface



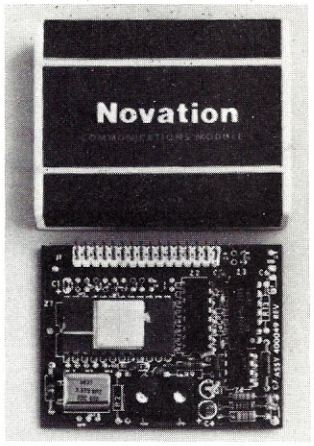
Addmaster's Model 170 Apple-compatible printer.

includes the Centronics-type handshake and DB-25 interface connector. The printer provides 18 or 21 characters per line, six-lines-per-inch print density, on standard 2-1/4-inch adding machine tape. An original plus one carbonless copy can also be printed.

An internal three-line buffer, ASCII or Baudot input code (switch selectable), upper- and lowercase characters and an internal clock and calendar are standard. Priced at $299. Reader Service number 493.

Modem Modules For Data Communications

Multi-capability modems that communicate on a variety of networks and operate at various baud rates (0 to 1200) and functional modes were announced by Novation, Inc., 18664 Oxnard St., Tarzana, CA. These include a low speed (300 baud) modem that features full or half duplex, answer or originate plus self test; a CCITT low speed (300 baud) modem featuring V.21 compatibility; a phone line interface with auto or manual answer, pulse dialing control, multitiming function and line busy with solid-state holding circuits but without bulky transformers or coils; and a deaf modem module that interfaces with the deaf TTY network. Prices begin at $99. Reader Service number 498.



Novation, Inc. manufactures a variety of modems for different applications.

TRS-80 Communications Mutiplexer.

TRS-80 Communications Multiplexer

The TRS-80 Model II can respond to simultaneous information requests from 16 telephone lines with Radio Shack's Communications Multiplexer. This makes the Model II suitable for use as a host computer in Videotex information retrieval networks.

The TRS-80 Communications Multiplexer is available in two versions, either with eight-line capability for $6000, or expanded to sixteen-line capability for $8000. Available by special order on-

✓See List of Advertisers on page 242

ISAAC laboratory data acquisition system by Cyborg.

ly from Radio Shack Special Marketing, 1600 One Tandy Center, Fort Worth, TX 76102. Reader Service number 494.

Apple-II-Based Laboratory Computer

The new ISAAC system from Cyborg Corporation, 342 Western Ave., Boston, MA 02135, converts the Apple into a real-time industrial computer system for data acquisition, instrument control, automated testing and process control functions. Fields of application include chemistry, engineering and life sciences in industry, research and education. Sampling rates are competitive with many larger computers. The Apple can easily be disconnected and moved for separate word processing, accounting and personal uses. The ISAAC/Apple System can also be used for front-end processing to central computer systems.

The ISAAC system includes encased input/output hardware, extended BASIC and self-teaching tutorial. The price is $3950. Reader Service number 490.

The Smith System microcomputer table adjusts for the operator's comfort.

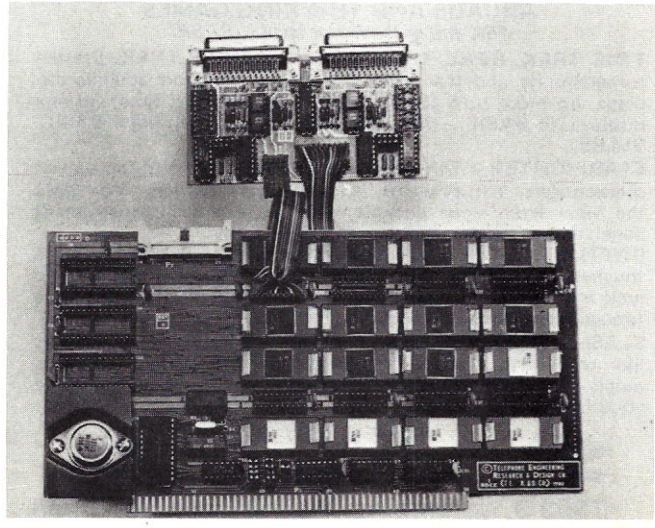
Ergonomic Microcomputer Tables

This functional microcomputer table adjusts to fit both the operator and the computer. The 16-inch-deep keyboard surface adjusts vertically on one-inch centers from 24 to 28 inches high. The 16-inch-deep monitor surface is fixed at 30 inches high. Both have soft rounded edges for comfort and safety. Tops are available either 30 or 42 inches wide. The table has a cantilever design for easy access.

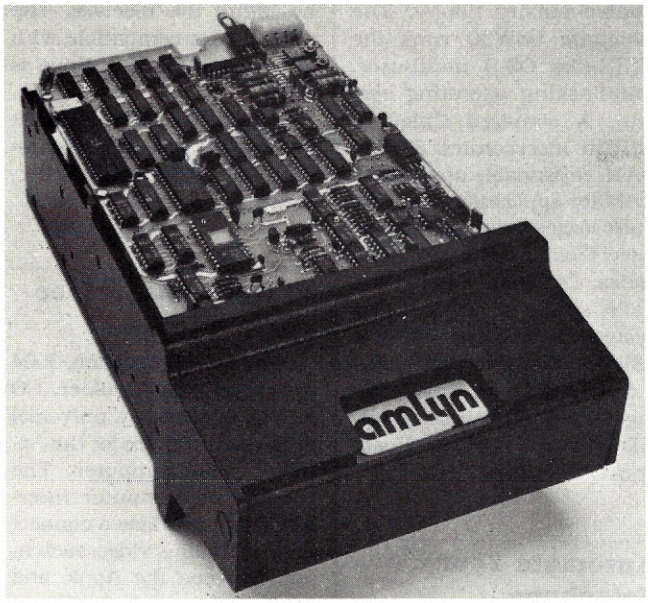
Smith System, PO Box 43515, St. Paul, MN 55164. Reader Service number 491.

PCB for Multiterminal Systems

The S-100 serial I/O board from Telephone Enterprises, 1600 Fordham Ave., Thousand Oaks, CA 91360, packs 16 duplex ports on one standard-sized board. Each of the



Multi-user I/O board from Telephone Enterprises.



Disk drive from Amlyn Corporation.

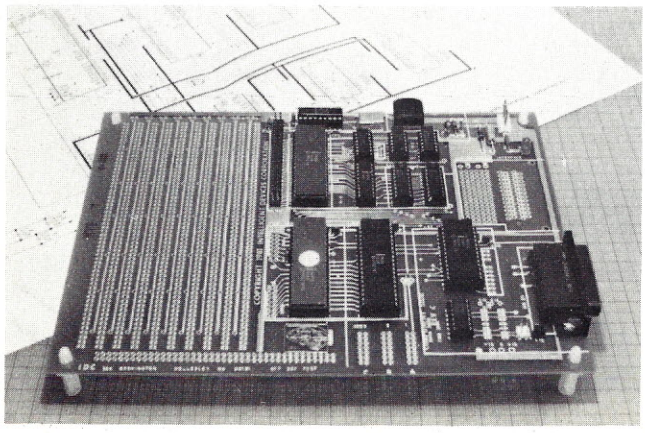
ports can operate at any one of 16 internal baud rates. An associated 4-1/2-inch × 2-1/2-inch board has two identical circuits for two duplex ports. Each circuit carries a turnover socket and option plugs and connects to the S-100 board via a plug-terminated 20-conductor ribbon cable. The other side of the board has two standard 25-pin RS-232 sockets. Reader Service number 489.

Disk Drives Use Five-Disk Cartridge

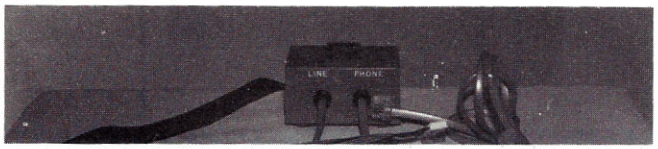
Amlyn Corporation, 1758-H Junction Ave., San Jose, CA 95112, has two new 5-1/4-inch floppy disk drives. The drives employ a unique five-diskette cartridge to provide up to 8 megabytes of data storage for use in on-line computing applications and for backup of Winchester disk drives. The Model 5850 is compatible with controllers that interface to the Shugart Associates SA850 double-sided, double-density Maxi-Drive; it appears to the controller and software to be five SA850 drives. The Model A506 is compatible with controllers that interface to the Seagate Technology ST506 Winchester disk drive, but it operates at 1/10th the data transfer rate because of the difference in disk rotation speed. Reader Service number 488.

Printed Circuit Board for Intel's ECK-8

Intelligent Devices Corp., 554 Washington St., Welles-



The IDC-8 PCB from Intelligent Devices Corp.



Compudyne's little blue box connects your Apple to the telephone.

ley, MA 02181, has announced the addition of the IDC-8 printed circuit board to their line of support products for Intel's Educational Component Kits. The IDC-8 contains the circuitry needed to build a CPU subsystem based on the 8-bit 8088 microprocessor. It features a custom serial interface area, and more than 18 square inches of board space for wire-wrapping special designs and adding peripheral support circuitry and chips. The IDC-8 is suited for educational applications involving heavy course loads of experimentation and lab work. The 8088 is a 16-bit internal and 8-bit external microprocessor fully compatible with Intel's 80/86 family of microprocessors and peripheral support chips. A separate accessory kit includes the sockets, resistors, capacitors, diodes, cables and standoffs necessary for assembly. The IDC-8 PCB costs $47; the IDC-88 Board/Accessories Kit costs $87. Reader Service number 483.

Microcomputer Features 30-Megabyte Winchester Drive

The Chieftain 98W30 microcomputer is based on Motorola's 6809 processor. It houses a 30-megabyte eight-inch Winchester disk drive, and uses standard backup of 1M eight-inch double-sided double-density floppy. The Chieftain 98W30 runs the UNIX-like OS-9 multi-user, multitasking operating system. A standard Chieftain 98W30 incorporates 32K of RAM, expandable up to 1M of RAM for applications that require larger memory, such as Level II of the OS-9 multi-user series. DOS69D, Smoke Signal's single-user operating system, is included with the 98W30. Base price is $9995.

Smoke Signal Broadcasting, 31336 Via Colinas, Westlake Village, CA 91361. Reader Service number 482.

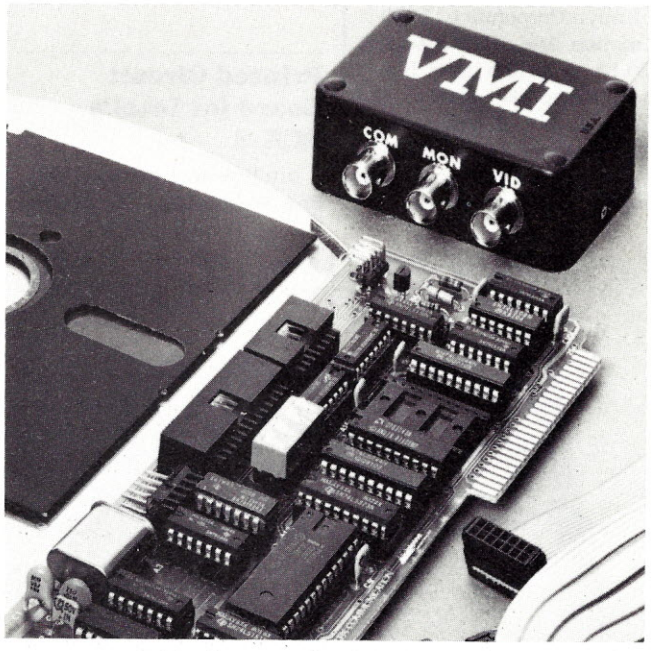
Automate Your Telephone

The Tele-Mite telephone dialer/controller attaches directly to your Apple II game controller. The paddles can still be used by using the Tele-Mite jack. One end of Tele-Mite plugs into the standard miniature telephone wall jack while the other end plugs into your telephone. The unit permits automatic dialing of a selected phone number and automatic redial if the line is busy. Speed dialing of the 20 most-often-called numbers is cued by entering the two-digit speed number—Tele-Mite completes the call. Your phone can be put on hold and then released automatically by lifting the receiver. The controller is compatible with all types of dialing. Price is $150.

Compudyne, Department TMKM, PO Box 3594, Stamford, CT 06905. Reader Service number 495.

Videodisc Interface For Apple II

Allen Communication, 3004 Arapahoe Ave., Boulder, CO 80303, is offering a universal videodisc interface for the Apple II microcomputer. The Video-Microcomputer Interface (VMI) provides a connection, including video switching, between the Apple and the complete series of Disco-Vision Associates' industrial videodisc players, the Sony LDP-1000 optical, industrial videodisc player and the Pioneer VP-1000 Laserdisc player. The VMI package features a standard parallel interface with eight-bit bidirectional port, two control lines out, one control line in and a standard RS-232C serial interface with protocol. VMI also includes a current-pulse serial transfer interface, for use with the Pioneer Laserdisc player. A ROM socket for 2K, 2716 EPROM applications and on-board rocker switches are also included. Price is $575. Reader Service number 487.



The Video-Microcomputer Interface from Allen Communication.

↙See List of Advertisers on page 242

NEW SOFTWARE

Edited by Linda Stephenson

Apple II Graphics Printer
Project Scheduling System
Bird Classification Program
Software Development System

High Resolution Printing

Progressive Software, Blue Bell, PA 19422, has released the Graphics Printing System. This software permits high-quality printing of Apple II high resolution images on daisywheel printers such as Diablo 1620 and 1640 and thimble printers such as NEC 5510 and 5620. Images can be visually selected from any rectangular part of the screen and printed with single-dot accuracy in numerous sizes and with a wide variety of aspect ratios. Any available character can be chosen. The package costs $109.95. Reader Service number 464.

Critical Path Project Scheduling

PMS II, a complete project management system, has been announced by North America MICA, Inc., 11772 Sorrento Valley Road, San Diego, CA 92121. The system uses the Critical Path Method of project scheduling and control. It includes a complete set of tools to aid managers in the construction, calculation, maintenance and reporting of projects with up to 500 activities. The system is suitable for construction, engineering and a variety of prototyping projects. PMS II calculates the critical paths based on a three, four, five, six or seven day work week. The network is easily updated with actual data about costs, starts, completions, changes in dependencies and/or duration. PMS II is available in CBASIC 2, CP/M, Microsoft BASIC and ANSI-74 COBOL. Price is $995. Reader Service number 466.

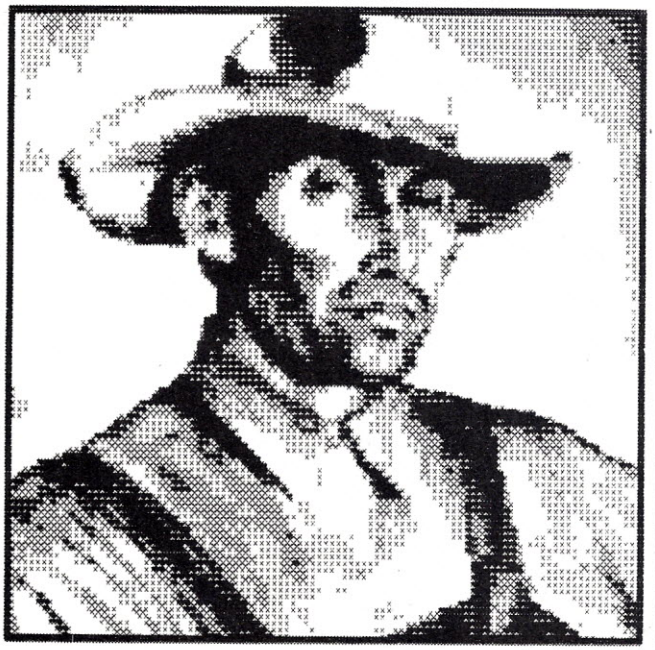
Bird Classification Program

Aviculturist II enables the Apple II user to retrieve information on any of more than 1000 species of birds. Output selection menu gives three choices of known data—26 U.S. habitat zones, size in inches and color. The program will retrieve name of bird, order, size, status, color, diet, habitat, nest site, nest structure and number of eggs. The program is suitable for junior high and high school students for biology classes, and for bird watchers who want to store their findings and retrieve or compare them with others. Price is $50.

American Avicultural Art and Science, Inc., 3268 Watson Road, St. Louis, MO 63143. Reader Service number 465.

MAE Software Development System

Eastern House Software, 3239 Linda Drive, Winston-Salem, NC 27106, is offering their macro assembler/text editor (MAE) Software Development System for the Commodore, Apple and Atari microcomputers. The extensive text editing capabilities and program development utilities are designed to aid professional programmers. The assembler and editor functions are coresident for ease of use. Features include macros, conditional assembly, interactive assembly, up to 31 characters/label, string search and/or replace and other editing facilities. A word processor is included to aid in the development of program descriptions, manuals and other text. A cross-assembler version which assembles 6800 source code is available. Price is $169.95. Reader Service number 467.



Progressive Software's graphics system lets you print high resolution images from the Apple screen.

FORTH Update

Floating Point FORTH, a new product from Timin Engineering Company, 9575 Genesee Ave., Suite E-2, San Diego, CA 92121, lets the user work with decimal numbers as in BASIC and FORTRAN. The 16-bit and 32-bit integer capability of FIG FORTH is retained, but a floating point mode is added. These are single-precision floating point numbers with approximately seven significant decimal digits. Floating Point FORTH runs on Z-80/8080/8085 hardware systems with CP/M or CDOS. Minimum memory size is 28K. Release 2 of Timin FORTH including the floating point vocabulary is $195; release 3, including floating point, is $335. Reader Service number 469.

Pascal Option to Oasis Operating System

A new Pascal option to the Oasis operating system combines the structured programming capability of Pascal with the power of a multi-user software system. With many extensions to the UCSD Pascal from which it is modeled,

Oasis Pascal allows separate compilation of routines. Module, export block and import block declarations provide unrestricted construction of procedure libraries. Separately compiled modules are assembled into linking loader formats and combined with other modules to form libraries of routines and global variables. Price is $450.

Phase One Systems, 7700 Edgewater Drive, Suite 830, Oakland, CA 94621. Reader Service number 471.

Scout

Football Scouting Report is a system of programs that will analyze running, passing and kicking plays on a TRS-80 Model I or III computer with 32K, one disk drive and printer. A team can be scouted up to five times before running a composite analysis, or each game can be analyzed separately. Eight programs look at different play situations. The package, suitable for college and high school scouting, is priced at $89.95. Documentation is available separately for $3.95.

Precision Prototypes, 410 E. Roca, Refugio, TX 78377. Reader Service number 472.

Computer Bowling

Tenpins is a machine-language bowling game for one to four players. This graphic game brings realistic bowling alley action and sound to the TRS-80. Beginner and advanced levels provide challenge for all "bowlers." Scoring, pinsetting and ball return are automatic, and the entire scoresheet can be displayed at any time. Tenpins on cassette for Models I and III is $14.95; on disk, for Model I, it is priced at $20.95.

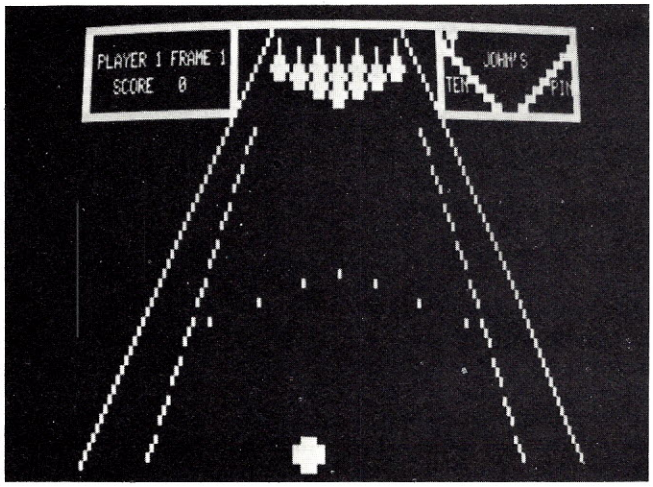
Acorn Software Products, Inc., 634 North Carolina Ave., SE, Washington, DC 20003. Reader Service number 468.

Packet Man

American Small Business Computers, 118 South Mill St., Pryor, OK 74361, announces Packet Man—a new game for the Radio Shack Color Computer that is said to be as good as the arcade game. Written in machine code, this game combines the excellent graphics of the Color Computer with the speed of a machine-code program. The program costs $24.95. Level II 16K is required. Reader Service number 470.

LISP for the TRS-80

The Department of Computer and Information Science at the University of Oregon, Eugene, OR 97403, announces the availability of Little Big LISP for the TRS-80 Model I computer. The system requires a minimum of 32K bytes of RAM and a single 5¼-inch floppy disk drive. It includes the following programs: the LISP interpreter for a large subset of Standard LISP which includes integer arithmetic, strings, all list handling functions, disk I/O, TRS-80 graphics, a garbage collector and support package fast load program; a LISP



Tenpins bowling game from Acorn Software Products.

See List of Advertisers on page 242

compiler for speeding up the execution of interpreted functions; a trace package for monitoring the execution of programs; a LISP structure editor; the RLISP programming language which provides a high-level-language interface to LISP resembling ALGOL and Pascal; and some sample programs in LISP and RLISP.

The complete system with documentation is available on single-sided, single-density 5¼-inch disk for $30. Complete source listings are available on magnetic tape for $100. Reader Service number 473.

6809 Pascal Compiler

Technical Systems Consultants, Inc., PO Box 2570, 1208 Kent Ave., West Lafayette, IN 47906, has announced a 6809 native-code Pascal compiler for operation under Flex and UniFlex operating systems. The compiler produces 6809 assembly-language source mnemonics, which are assembled into object code, thus speeding program execution. The compiler supports most of the Jensen and Wirth Pascal specifications, plus other operating system features. The UniFlex version supports random access files, and includes a special systems run-time package that allows Pascal programs to make direct calls to operating system routines; it costs $300 and includes one year of maintenance. The Flex version costs $200. Reader Service number 474.

Software Development System

The Micro Works, PO Box 1110, Del Mar, CA 92014, now offers a complete 6809 editor/assembler and monitor package for the Radio Shack Color Computer. The SDS80C is nonvolatile, so if an application program bombs it can't destroy your editor/assembler. The screen-oriented editor finds, changes, moves, copies and performs other functions. No line numbers are required. The assembler supports the complete 6800 set for cross-assembly, conditional assembly, local labels, assembly to cassette tape or memory, listing to screen or printer and mnemonic error codes. The ABUG monitor is a compact version of CBUG, tailored for debugging programs generated by the editor/assembler. It includes examine/change of memory or registers, cassette load and save and breakpoints. Price is $89.95. Reader Service number 475.

CP/M BASIC Interpreter

Control-C Software, Inc., 1556 SW 66th, Portland, OR 97225, offers a new BASIC interpreter that runs under CP/M 2.2 and can execute Business Basic II programs. The system can be used for languages, utilities and programs developed under CP/M, as well as the many tested and installed business applications written in BB II. The BI-280 (Basic Interpreter Level II for the 8080/Z-80) supports a single user under a 64K RAM system and costs $600; a version that supports four users under a 128K bank-switched version of CP/M costs $1000. Reader Service number 476.

Personal Calendar

Schedule helps a North Star microcomputer user keep track of events by time and date. He can record business expenses, appointments and activities. The program will handle up to ten items per day for one year. Timed events are sorted in order and printed or displayed ahead of untimed events. All items are held unless deleted. You can list or display your calendar by day or for any selected period. Equipment required includes a North Star disk drive, operating system and BASIC, and 32K of memory.

Azimuth Associates, PO Box 1636, Arlington, VA 22210. Reader Service number 477.

TRS-80 Model III Database Manager

IDM-M3, a new member of a series of interactive database managers, provides a simple solution to database management problems. You can use it to computerize many of your applications without any programming. IDM comprises a

database initialization program, a database manipulation program, a report writer and a report generator. This data manager requires a dual disk system with 48K memory and TRSDOS. Priced at $149. A simplified 32K version of IDM is priced at $69.

Micro Architect, Inc., 96 Dothan St., Arlington, MA 02174. Reader Service number 479.

Move Pascal Files to Apple BASIC

A user-friendly Pascal utility package designed for the Apple Pascal 1.1 environment is available from Gryphon Microproducts, PO Box 6543, Silver Spring, MD 20906. PUP-II moves Pascal text files to a BASIC disk, and displays and modifies any byte from a Pascal or BASIC disk. PUP-II features Pascal wild card support, 40/80-column format, upper- or lowercase, error-checking with simple diagnostic messages, single- or multi-drive operations, on-line user assistance and full user documentation. Price is $29.95. Reader Service number 480.

A Faster DOS

TurboDOS can replace CP/M on any Z-80-based microcomputer, and load programs up to six times faster. It handles file-oriented applications up to ten times faster, and reduces the number of physical disk accesses. Most CP/M applications will operate under TurboDOS without modification; programs which rely on internal CP/M data structures or use the bit maps won't.

The command language interpreter accepts strings of multiple commands, not just single commands. An extensive set of utility programs, system data and time functions, standard communications channel interface and other capabilities not available in CP/M are provided with the operating system. TurboDOS is available for the IMS line of S-100 computer systems, the Radio Shack Model II and the INFO 2000 Performer series of business computers. Prices vary with configuration.

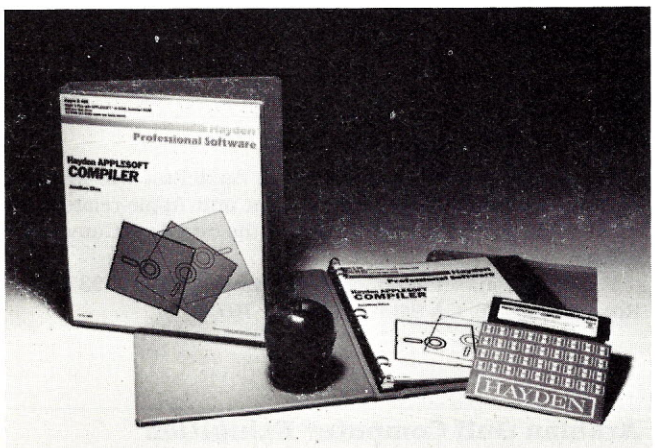
Data-RX, Inc., 686 Lighthouse Ave., Monterey, CA 93940. Reader Service number 478.

Applesoft Compiler

The Hayden Applesoft Compiler translates a standard Applesoft BASIC program into true machine code. The resulting binary program runs from three to more than 12 times faster than normally interpreted code—the longer and more complex the original program, the greater the increase in execution speed. Compilation is a one-step procedure. The user specifies the name of the program to be compiled and then BRUNs the compiler program. Optional compilation parameters can be specified to alter the default memory configuration of the target file.

The compiler requires 48K of RAM, Applesoft, the Autostart ROM and one disk drive. Price is $200.

Hayden Book Company, Inc., 50 Essex St., Rochelle Park, NJ 07662. Reader Service number 481.



The Applesoft Compiler from Hayden Book Company.

✓See List of Advertisers on page 242

CALENDAR

National Computer Conference

A conference on issues for the new era in computers and information will be held Oct. 5–6 at the Shoreham Hotel in Washington, DC. The conference is sponsored by the Commission on Software Issues in the '80s. The fee for member organizations is $295; for nonmembers it is $320.

Direct inquiries to Software Conference, 12611 Davan Drive, Silver Spring, MD 20904. 301-622-0066.

Houston Business Show

Business and Personal Computer Sales Expo and the 1981 Houston Business Show will be held Oct. 15–17 at the Houston Civic Center in Houston, TX. For more information, contact Produx 2000, Inc., Box 2000, Bala Cynwyd, PA 19004. 215-457-2300.

Microcomputer Graphics Workshop

A one-day workshop designed as a practical preparation for making intelligent purchasing decisions will be held in Boston on Nov. 14. It will present an overview of applications, graphics features, system integration considerations, price ranges and information sources. Registration is $20.

For information, call or write Jean L. Graef, Cambridge Development Laboratory, 36 Pleasant St., Watertown, MA 02172. 617-926-0869.

COMDEX Show

The third annual COMDEX Conference and Exposition for independent sellers (ISOs) of small computer products will be held at the Las Vegas (NV) Convention Center Nov. 19–22. The conference will feature business, marketing and financial topics of relevance to ISOs.

For further information, write The Interface Group, 160 Speen St., Framingham, MA 01701 or call 800-225-4620 (in MA, 617-879-4502).

Data Communications Seminar

A McGraw-Hill seminar on Local Area Networks (LANs) will be held Oct. 27–28 at McGraw-Hill World Headquarters in New York City. Sponsored by *Data Communications* in cooperation with Network Analysis Corporation, this meeting will cover current topics in the field.

For further information, contact McGraw-Hill Conference and Exposition Center, 1221 Avenue of the Americas, Room 3677, New York, NY 10020. 212-997-4930.

National Computer Shows

National Computer Shows will sponsor the following two shows this fall: The Southeast Computer Show & Office Equipment Exposition, Oct. 29–Nov. 1 at the Atlanta Civic Center, and the third annual Northeast Computer Show and Office Equipment Exposition, Oct. 15–18 at Boston's Hynes Auditorium.

Call or write National Computer Shows, 824 Boylston St., Chestnut Hill, MA 02167. 617-739-2000.

TERC Workshops

The fall series of workshops, "Microcomputers in Education," offered by the Technical Education Research Centers (TERC), will be held in the Eastern Region—College Park, Maryland, October 2–4; Toronto, October 22–24; and Cambridge, Massachusetts, November 22–24. Eight one-day workshops are designed for professional development for educators at all levels, elementary through college.

Each workshop will emphasize hands-on experience with a variety of microcomputers. Extensive workshop reference materials will be given to participants. Special evening symposia will be held that address topics on current trends in microcomputer applications to education. For further information on these and upcoming workshops in other locations, write: TERC, 8 Eliot St., Cambridge, MA 02138.

Vancouver

Vancouver's second annual Computer Fair will take place Oct. 3–4 at the Robson Square Media Center in downtown Vancouver.

This year's theme is "Computers and the Handicapped," in recognition of the International Year of Disabled Persons. There will be more than 50 exhibits by commercial distributors, clubs, user's groups and organizations for the disabled.

The show is produced by Pacific Coast Computer Fair Association, 4100 St. Georges Ave., North Vancouver, B.C. V7N 1W8.

Philadelphia Area Computer Show

A show sponsored by the Philadelphia Area Computer Society will feature applications of small computers in education, business and leisure. Show dates: Nov. 12–14.

For further information contact Stephen A. Longo, Ph.D., Physics Department, La Salle College, Philadelphia, PA 19141. 215-951-1255.

California Computer Faire

The Silicon Gulch Games Faire & AppleFest will focus on electronic products for entertainment and Apple-related products. Scheduled for Nov. 21–22, at the San Jose Convention Center.

For further information, contact Computer Faire, 333 Swett Road, Woodside, CA 94062. 415-851-7075.

Arabian Gulf Computer Exhibition

The Gulf Computer Exhibition will be held in the Dubai International Trade Centre's Exhibition Hall from Dec. 15–19. The

Gulf Computer Conference will be held at the same time (Dec. 16–17) in the Trade Centre Theatre.

The exhibition will cover all aspects of computer software and hardware and computer books and periodicals. The events are aimed at the senior management of private companies using or needing computers, the technical staff handling the equipment and senior government officials in the United Arab Emirates, Qatar, Oman, Bahrain, Yemen, Kuwait and Saudi Arabia.

It is organized by Trade Centre Management Company, PO Box 9292, Dubai, UAE. Telephone 472200. Telex 47474 DITC EM.

NYU Workshops

New York University's School of Continuing Education will sponsor a series of workshops to teach home computer use. These one-day seminars on personal computing run from 9 AM to 4 PM on Saturdays throughout October and November at NYU's Midtown Center (11 West 42nd Street). For further information contact the Office of Public Information, NYU School of Continuing Education, 126 Shimkin Hall, New York, NY 10003. 212-598-3991.

Symposium on Small Computers in the Arts

A wide range of presentations are planned to bring together people interested in using small computers in the audio and visual arts. The symposium will be held at the University City Holiday Inn on the campus of the University of Pennsylvania on Nov. 20–22.

For information, write to Symposium on Small Computers in the Arts, Box 1954, Philadelphia, PA 19105. 215-243-8109.

↙See List of Advertisers on page 242

Using CP/M
Two Dictionary Reviews
8085 Fundamentals and Applications
Programming and Interfacing the 6502

Using CP/M: A Self-Teaching Guide

Judi N. Fernandez and Ruth Ashley
John Wiley & Sons, Inc., 1980
Softcover, 243 pp., $9.50

What you always wanted to know about CP/M and couldn't possibly figure out from the manuals! This tutorial is a must for any nonprofessional programmer using CP/M—the informal standard disk operating system for business programs. After working through this programmed text, you will want to keep it within reach as a ready reference.

Starting from ground zero with a short introduction to the organization of CP/M, the authors lead you gently from the simplest commands to sophisticated usage of the more complex capabilities of the system. Each of the ten chapters presents a brief overview of its subject, then offers short, understandable teaching segments in a question-and-answer format. The material is well-organized, and each module builds logically on the prior information.

The chapter ends with a self-test that reviews the essentials, and some suggested machine exercises. The examples in the text explain your interaction with the system, but you will learn CP/M much faster through the practical hands-on experience of doing all the exercises as you read the book.

Chapter 2 introduces you to the required format for commands and to the use of control characters. Built-in commands are described in Chapter 3: DIR(directory), ERA(erase), REN(rename), TYPE (list) and SAVE. Use of wild card or generalized file references is explained, and any differences between versions 1.4 and 2.0 of CP/M delineated.

The next three chapters introduce the CP/M transient programs with detailed information for STAT(status) and PIP (copy), since you will probably use these commands the most. Various PIP parameters are presented so that you learn to use this powerful command to locate and copy anywhere from a single string in a file to several related files. A few PIP parameters which are used primarily in assembly-language programming are not included. Similarly, ASM(assembler), LOAD(convert HEX file to machine code), DUMP(print file in HEX) and DDT(debugging routine) are described only very briefly, since assembly-language programming is beyond the scope of the text.

Three chapters are devoted to using the text editor (ED). You start with simple creation and revision of a file in memory. Then you progress to more complex revisions of prior programs and finally to combined commands, using combined commands as macros and creating library files which can be inserted by reference in other files.

The Submit command, which lets you build a subroutine consisting of a group of commands, is illustrated in the final chapter. As icing on the cake, Appendix C, which can be copied and used as a working guide, contains a summary listing of CP/M commands and control characters.

Examples throughout the book are useful and practical. Effects of typical erroneous or illegal entries are illustrated and explained.

After you have completed the book and the exercises, you will have a good working knowledge of the flexibility and capabilities of CP/M. You should also have an understanding of the foundation on which the powerful word processors such as WordStar and Magic Wand and many of the accounting packages are based. I recommend *Using CP/M* to anyone running software based on the CP/M system.

Charles R. Perelman
Culver City, CA

The Devil's DP Dictionary

Stan Kelly-Bootle
McGraw-Hill
141 pp., $7.50

Humor and computers rarely intersect. It's difficult to think of more than a half-dozen computer books that are intentionally funny. It's a shame. Any endeavor that can coin such quaint terms as mini-floppy and debugging can't be all serious.

Attempting to fill this sad void, *The Devil's DP Dictionary* strives to ridicule pompous jargon, deflate an overblown lexicon and poke some good-natured fun at the world of computerese. In all of these aims, the book fails miserably.

What author Stan Kelly-Bootle (his name may well be the funniest part of the book) has created here is a work of unending tedium. His comments on computer jargon are neither pungent nor witty; his attempts at computer humor, amazingly lame. Had the late Bennett Cerf tried his hand at writing a similar book, the results could not be more disappointing.

Kelly-Bootle, however, is no ordinary computer buff turned punster. Judging by his background, he would seem to have excellent credentials for writing such a book. Educated in computer science and mathematics at Cambridge, the author went on to forge simultaneous careers in computing and entertainment. In the former area, he has worked for such firms as IBM and Sperry-Univac; in the latter, he has written a song for Judy Collins and appeared on such TV shows as Tonight and The David Frost Show.

But whatever Kelly-Bootle's talents, they certainly don't exhibit themselves in this book.

As the title suggests, the volume is assembled in dictionary form. Unfortunately, the book is so ineptly constructed, with odd snatches of poetry, cartoons and popular song quotations illogically accompanying definitions, that the entire work becomes muddled and confusing.

But just how crummy is the humor? Try these two random definitions on for size:

"*ASCIII:* American Standard Code for Interchanging Irrelevant Information."

"*Microprocessor:* twenty years of architectural bungling concentrated into a single chip."

Funny? Like catching your finger under a daisywheel.

You want humor? How about a $7.50 cover price for a 141-page paperback?

Otherwise, the wittiest thing that could ever happen with this book would be a neophyte computerist taking it seriously. Now, that's funny!

John Edwards
Glendale, NY

Computer Dictionary for Everyone (New Edition)

Donald D. Spencer
Charles Scribner's Sons, N.Y., NY
Paperback, 192 pp., $5.95

The man has an M.A. in economics, is intelligent, capable, and lost. His company has decided to go computer. One company has advised smart terminals, on-line with a large mainframe; another recommends a 64K card system at $40,000, without software, and every day in his newspaper he sees complete micro systems for $2500. None of the buzzwords are in the dictionary he bought for college seven years ago.

A good glossary of microcomputer terms has been needed for some time. This micro-oriented rewrite of an earlier work (published by Camelot, 1977) is excellent.

The author is well-qualified. The list of books on computers written by Mr. Spencer is impressive. Many are for secondary education, grade school and teachers. At least one, *Sixty Challenging Problems with BASIC Solutions*, is considered a classic. His wide background has allowed him to balance well the many facets of this industry.

Professional computer organizations, biographies of early developers, diverse languages and descriptions of historic machines are included. Business management, educational and professional computer terms are listed, as are mathematical terms needed for computing. Finally, since the terms in microcomputing are quite different from those in the mainframe computer field, the words specifically used in microcomputing are indicated in the definition.

Two sore spots in most dictionaries have been eliminated by Spencer. Terms that are most commonly referred to by acronym are alphabetized, making it easier to find them. Also words are not left out of the book just because their computer use is nearly the same as their common use. This is important because the neophyte has no way of knowing the use is the same. (This is the first computer dictionary I've seen that defines default.)

The book is well-balanced, and the definitions are easy to understand. If you know someone who is confused, give him a copy.

Dennis Thurlow
Antrim, NH

The 8085 Microprocessor: Fundamentals and Applications

Howard Boyet
MTI Publications, 1980
Paperback, 420 pp., $17.95

This book purports to be usable by anyone with "no previous background with computers (micro or otherwise), programming, or digital logic." It claims to be useful to (among others) "administrators, managers, executives, marketing people." Lotsa luck!

On page 1 the binary number system is completely covered by two equations and two lines of numbers explaining bit weighting. Octal and hexadecimal number systems are similarly "explained," with half a page devoted to each. And these pages are typewritten, double-spaced. Not much room for textual discussions of what the equations mean. But that's OK, since no such text is included. This is hardly subject matter for nontechnical people.

Even though the book claims to be a self-teaching guide, it reads like a set of hastily-compiled lecture and lab notes. I suspect that's exactly what it is. The book is virginal, and a writer's dream, in that it has never been touched by an editor. This is a shame, for if ever a book needed an editor, this is it.

While technical books do not need to read as smoothly as novels, this one is jammed full of such delightful constructs as: "Time Delay can be accomplished by loading a register(s) with a byte(s) (as shown) and then decrementing it (them) till it (they) is (are) 0." That is a direct quotation—honest! Equally intriguing is the discussion of addressing, covering "indirect," "direct" and "somewhat direct." Well, you learn something new every day.

This book can have only one purpose: to be used in conjunction with one of the courses in microprocessor technology presented by Microprocessor Training Inc. (MTI). Claims to the contrary, it cannot stand alone. Ignoring its unreadability, there is insufficient background material to permit a beginner to learn the subject matter without the guidance that would be included with the training seminars. This is a shame, because the subject matter is useful, interesting and reasonably accurate.

Unlike texts covering programming for problem solving, this book covers hardware and software techniques for controlling the real world: "process control, data acquisition storage and retrieval, CNC (computer numeric control) and automation," to quote the preface. It introduces the student to the Intel SDK-85 system development kit, and the 8155 RAM-I/O and 8355 ROM-I/O superchips on the SDK. Using these I/O controllers, connections are made to lamps, motors, D-A converters, solid state relays, etc., in interesting experiments.

The cover announces that the text includes 76 control experiments with the Intel SDK-85, and that it does. The experiments are really great, and will teach not only the fundamentals of programming for control, but the use of the more complex peripheral ICs as found on the SDK-85. But I'd hate to try to adapt the experiments to any other hardware environment, as the cover also claims is possible. In the cold light of reality, the book should only be used with the SDK-85. The experiments are too hardware-specific for a student to be able to adapt them to any other system.

But no student would ever be able to use this book as a self-teaching guide anyway. I suspect that Dr. Boyet and Microprocessor Training Inc. have put together a super training seminar, and I for one would love to attend it. The book would, of course, be useful within such a course. But I can't recommend that anyone attempt to use this book for self-instruction. While it contains those 76 illuminating experiments, they are not explained in a way that a beginner could follow.

Ken Barbier
Borrego Springs, CA

The Devil's DP Dictionary: "What author Stan Kelly-Bootle (his name may well be the funniest part of the book) has created here is a work of unending tedium."

Design of Phase-Locked Loop Circuits, With Experiments

Howard M. Berlin
The Blacksburg Continuing Education Series
Softcover, 245 pp.
Available from Group Technology, Inc., PO Box 87, Check, VA 24072 for $9.95 postpaid.

Although phase-locked loops (PLLs) have been in use since the early '40s, not until the less expensive PLL integrated circuit did they become more cost-

effective.

Up until now, however, there has been a dearth of published information on PLLs, other than manufacturers' data sheets, making this book must reading for anyone who wants to understand and use PLLs without having to wade through pages of mathematical derivations and formulae.

The book covers the principles of the integrated circuit PLL with sufficient mathematics to enable the reader to understand and use the circuits, without placing too much emphasis on mathematics in the text. More than 15 experiments fully illustrate the concepts presented.

To get the most out of the text/workbook, a dual-trace oscilloscope, a frequency counter with 1 Hz resolution, a digital voltmeter and a function generator should be on hand. Don't be deterred by the equipment requirements, however. Most serious experimenters either own or have access to the equipment. If the equipment is not available, a lot of knowledge can nonetheless be derived from the book.

After covering the three basic building blocks of a PPL (phase, detector, loop filter and voltage-controlled oscillator) in the introductory material, the author gives a detailed discussion of the first of the PLL building blocks, the phase detector.

Once the basic components of a phase detector are understood by studying discrete components, the author discusses an integrated circuit PLL, the Motorola MC4044. The IC is explained with the use of a block diagram, circuit diagram and a number of timing (waveform) diagrams. Beginning with Chapter 3 and throughout the book, a number of handy circuits, such as a "loss-of-lock" indicator, a frequency shift keying (FSK) demodulator, tone decoders, and so on, are presented and explained.

Chapter 4 discusses the second PLL building block, the voltage-controlled oscillator. The circuits presented are built around two ICs, the Motorola MC4024 and MC1648. Simple equations let the reader follow the example calculations. Typical of all equations presented, the equations stand on their own, without being proven.

Chapter 5 is mathematically the most complex chapter, covering the last PLL building block, the loop filter and loop response. The function of the loop filter is discussed and applied to low-pass filters. Both passive and active first-order filters are presented and explained.

The equations given are more detailed, to facilitate understanding, but are not mathematically overwhelming. The end-of-chapter experiment enhances comprehension of a complex subject.

Chapter 6 covers the basic operation of the PLL synthesizer, including techniques used in communications systems, and presents a number of divide-by-N counter circuits using transistor-transistor-logic (TTL) and complementary metal oxide semiconductor (CMOS) ICs. A block diagram is given for the basic components of a frequency synthesizer, followed by all equations necessary to design a frequency synthesizer and a synthesizer loop filter. The equations are of the "plug and chug" form, where you plug in the values and chug through the calculations with no real need to understand the calculations. Real-world examples are provided, so applications of the equations are readily apparent.

The balance of the chapter presents a number of practical circuits for crystal-controlled oscillators, divide-by-N counters, both fixed and preset, and programmable counters. Both TTL and CMOS circuit examples are given.

The last chapter describes several popular monolithic PLL ICs. The ICs described are packages which contain a phase detector, voltage-controlled oscillator and several specialized functions within a single package. Routine applications, such as an FM demodulator, an AM broadcast-band receiver, an FSK (frequency shift keying) demodulator and touch-tone decoders, are presented with circuit diagrams and text.

Appendix A provides derivations of the concepts and equations used. For students of control theory, this appendix alone is worth the purchase price. Appendix B provides complete data sheets, and some application notes on every PLL used in the experiments, plus a number of other related ICs. Appendix C describes various breadboarding aids available from E & L Instruments which will assist the reader in performing the experiments.

I recommend this book to anyone interested in learning about PLLs. The experiments have been so well-written that even the reader who does not perform the experiments can learn a great deal.

J. C. Hassall
Blacksburg, VA

Programming and Interfacing the 6502, with Experiments

Marvin L. De Jong
Howard W. Sams & Co.
Softcover, 414 pp., $13.95

This unique textbook includes very few conventional exercises. Instead, it contains experiments. Every chapter except the last one begins with a set of objectives that includes such action verbs as construct, convert, describe, interface, perform, program, use or write. The only conventional written exercises are at the end of Appendix A.

In the experiments are found such things as, "How would you modify the timing program to measure the time duration that PA7 is at logic zero? Flowchart your answer, then program and test it." The book generally gives either hints or

answers to such questions; in the above case, it shows a flowchart. An introduction follows the objectives, and this includes a discussion of the subject matter in the chapter.

The title suggests two concepts, and indeed, the book is divided into two parts. However, interfacing is not restricted to the second part. In Part I, programming in assembly and machine language is systematically presented beginning with how to turn on your computer. Examining and modifying memory begins in Chapter 1 with experiments. By Chapter 3, the book discusses simple input/output techniques, and the reader is on the way to begin interfacing.

At the end of ten chapters all 56 instructions, including the various addressing modes, have been covered. Demonstrations and experiments are available to reinforce the learning.

The title promises experiments, and the author lives up to his word. Eighty experiments are included before the last chapter. Many times the author suggests that you write some programs of your own, and gives ideas.

Although the book is about the 6502 microprocessor, all experiments refer to three microcomputers that use this processor and have compatible edge connectors. Some chapters contain experiments for the KIM-1, while other chapters are directly written for the SYM-1 or AIM 65. Tables in the text compare any ROM or RAM address differences among the three. Enough detail is given to construct an I/O board to connect to the applications edge connector on the computer for ease in performing the experiments. (Commercial versions of this board are also available.)

Chapter 5 on arithmetic operations is well-done, with 13 examples of adding and subtracting binary or decimal numbers, multibyte addition and subtraction, two's complement arithmetic and signed number arithmetic. The status register and flag modification are presented at this point. In experiment 3 a program that has a bug in it is entered using op codes. The student is instructed to use the single-step mode of operation and trace the accumulator to compare with what is expected from adding 20 and 22 in the hexadecimal form.

The chapter following those on subroutines, the stack and interrupts is devoted to interval timers found on the 6530, the 6532 and the 6522 integrated circuit chips. In this chapter, the interval timer is used for precision timing, frequency counters and frequency modulation for making music.

In the introduction to Part II, the author carefully expresses that interfacing means different things to different people in the world of microcomputers. This section of the book is devoted to concentrating on interfacing components up to and including I/O ports. The author feels that principles learned in memory-mapped I/O ports are applicable to interfacing problems.

Separate chapters are devoted to address decoding; control signals, output ports and applications; and data bus, buffering and applications. Interrupt lines are considered in Chapter 9. Power supply pins are mentioned in the introduction to Part II. After 13 chapters of the book, all pin connections of the 6502 have been discussed.

Considerable time is devoted to address decoding and generating device-select signals. The author builds on simple situations until the reader has the whole view. To do the experiments in Part II, breadboarding is needed and connected to the expansion port of the computer. Again, reference is noted of suppliers for the parts.

Applications developed in the first three chapters of Part II include memory-mapped digital-to-analog and analog-to-digital converters, music synthesis and an ASCII keyboard input port. The last chapter includes five applications programs that put together much of the previous material. All of these applications are written for the KIM-1 but are easy to convert to the SYM-1 or AIM 65.

The author has stated that this book is for beginners. By the time you, the reader, have finished studying it, you may be ready to create, add to or remodel your own 6502 microcomputer system. The author has achieved his objective.

William C. Porter
Toms River, NJ

New and Noted

The BASIC Handbook, second edition. By David A. Lien. Compusoft Publishing. Softbound, 480 pp., $19.95. A "vastly expanded treatment" of the first edition; includes nearly 500 BASIC words.

The Copyright Kit: How to Copyright Your Computer Software. By Noel D. Adler and Steven A. Hovani. National Attorneys' Publications, Inc., PO Box 150, E. Setauket, NY 11738. Softbound, 59 pp., $11.95. "A how to, why to, when to booklet, which takes the reader step-by-step through the copyright procedure."

Executive Computing. By John M. Nevison. Addison-Wesley Publishing Co. Softbound, 320 pp., $8.95. A book to "help the busy professional become a computer-literate executive."

The Logic Design of Computers. By M. Paul Chinitz. Howard W. Sams & Co., Inc. Softbound, 416 pp., $15.95. This book is concerned with "how the electrical/mechanical parts are interconnected to form a computer having the characteristics identified on the architectural level."

Pascal Programs for Scientists and Engineers. By Alan R. Miller. Sybex. Softbound, 378 pp., $16.95. Includes curve fitting, vector and matrix arithmetic, numerical integration, random number generation, statistical analysis.

Real Time Programming: Neglected Topics. By Caxton C. Foster. Addison-Wesley Publishing Co. Softbound, 190 pp., $8.95. Focuses on interrupts, input/output ports, digital filters, servomechanisms and communication over limited pathways.

The Soul of a New Machine. By Tracy Kidder. Atlantic—Little, Brown. Hardcover, 293 pp., $12.95. The most-anticipated book on computers ever published. Traces the development of a new computer at Data General by a group of young computer cowboys who called themselves the Microkids. Excerpted recently in *Atlantic Monthly.*

Take AIM. By James Hoyt Clark. Matrix Publishers, Inc. Softbound, 388 pp. A manual for the AIM 65.

32 BASIC Programs for the Apple Computer. By Tom Rugg and Phil Feldman. dilithium Press. Softbound, 284 pp., $17.95. Educational, applications, game, graphics and mathematics programs.

Webster's Microcomputer Buyer's Guide. Computer Reference Guide, 135 S. Harper Ave., Los Angeles, CA 90048. Softbound, 326 pp., $25. Includes sections on software vendors, microcomputers and microcomputer systems, and CRT displays, printers and printing terminals.

See List of Advertisers on page 242

CLUB NOTES

Z-80 User's Group

Cary Davids (6000 Puffer Road, Downers Grove, IL 60516) is planning to start a user's group for the SD Systems Z-80 Starter Kit single board computer. Anyone interested in sharing his programs, problems and experiences with the machine should contact him at the above address.

MACH Club

The Mid America Computer Hobbyists (MACH) computer club is an organization of computer hobbyists in Omaha, NE, interested in personal or small-business applications. Meetings are held on the second Tuesday of each month at the First Federal Savings and Loan Association of Omaha (1314 Galvin Road South).

Southern California PET User's Group

SCPUG (the Southern California PET User's Group) holds its meetings on the first Tuesday of each month at 7 PM at the Data Equipment Supply Corporation on 8315 Firestone Boulevard, Downey, CA. For additional information, contact Lyle Phillips, 213/693-3175.

Dental Computers

The Dental Computer Newsletter (DCN) is an international group of dentists, physicians and office management people who have an interest in office computers. For further information on becoming a member, contact E.J. Neiburger, Editor, 1000 North Ave., Waukegan, IL 60085.

French Club

A nonprofit microcomputer club in France wishes to contact other computer clubs in the U.S. and Great Britain to exchange information. Contact Marc Talenton, 6 Rue des Ormes, 94120 Fontenay-Sous-Bois, France.

CSRA Computer Club

The CSRA Computer Club (PO Box 284, Augusta, GA 30903) holds its meetings on the third Thursday of each month at 7:30 PM in the Student Center of the Medical College of Georgia, Laney Walker and 15th Streets in Augusta.

Northwest Computer Society

The Northwest Computer Society meets on the first and third Thursdays of each month at 7:30 PM at Seattle University.

Tallahassee Amateur Computer Society

A calendar notice in the June 1981 issue incorrectly listed the address of the Tallahassee Amateur Computer Society. The correct address is: Tallahassee Amateur Computer Society (TACS), PO Box 6716, Tallahassee, FL 32301.

CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The $5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The $10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

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Must Sell!!: TRS-80, 16K, Level II, tape digitizer, MDX-2 full interface, all game and programming software, programming aids in machine and ASSMBLR, schematic diagrams. Full package $559. Call 303-733-2439 or write to Wendell K. R. Hutchins, 1175 S. Lipan Unit #A, Denver, CO 80223. Shp'd UPS COD.

Needed: Western Electric and Bell System manuals on residential telephones and accessories, including model 500, Trimline, Touch-A-Matic S, speakerfone, jacks, wiring, installation procedures, etc. C. Sarver, 256 West 88th St., New York, NY 10024. 212-874-3529.

For Sale: I have over supply of new diskettes and other computer supplies. Too many to list here. SASE G. R. Davis, 16 W. Walnut Ave., Westmont, NJ 08108.

SOL-20 with SOLOS, GPM, ALS8 in ROM 1 North Star drive. No memory. Full documentation, in excellent condition, $1300. Joe Thomason, 509-422-6579 days or 422-4265 evenings.

For sale. Entire collection of *Kilobaud Microcomputing* mag., from issue 1 Jan. 77 to Sept. 81, complete with binders. New cond. $70. Also ST6 and 28 ASR RTTY system with UT4 and DDTMG and RTTY scope. Write for details. D. Wipperfurth, RT #1, Box 700, Flagstaff, AZ 86001.

Heathkit microprocessor trainer, assembled, with course and parts, $245. 516-486-4579.

32K Exidy Sorcerer, 9-inch Hitachi monitor, orig. and extra docs., some pgm. tapes. Exc. condition/value at $1000, shipped in US. R. DeSimone, 192 Pleasant Ave., Burlington, VT 05401.

For sale or swap: HP microprocessor training course. 5036A, 5004A, 5024A. Brand new condition. Price $2270 or swap for Tektronix 565B. W. Lindell, 757 Columbus, San Francisco, CA 94133.

For sale: 2REMEX RFD-4000 double-sided 8-inch disk drives. Each with formatted capacity of 1.2Mbytes. Fast step time—3 msec. Doorlocks, write protect. Used a total of 11 hours—like new. With power supply. $1000 or B.O. David Tulbert, 6700 Grauer Rd., Niagara Falls, NY 14305. 716-297-6347.

For Sale: HP 85 computer 16K, 5 data cartridges, carry case, many programs. All accessories. Excellent condition, $2500. Barry McDonald, 103 Godwin Ave., Midland Park, NJ 07432.

For Sale: HP 2621P CRT terminal 80×24 chars., internal thermal printer, 12 rolls paper, excellent cond. $1500. Barry McDonald, 103 Godwin Ave., Midland Park, NJ 07432.

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Our special thanks to Mr. McElwain. And to all our equally impressed customers.

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✓See List of Advertisers on page 242

By Edgar F. Coudal

Grow Your Own North Star, Apple Program Writer

The Grow program-generating system is a remarkable little software package. Its applications include the writing of individual instruction and lesson/test plans for students, knowledge networks (a catalog of recipes or records, for instance) and complicated adventure games—all with a minimum of computer knowledge.

The documentation—*The Grow Book*, a simple tutorial, and *The Grow Reference Manual*, a complete manual on using the system—presumes that you have *no* computer smarts at all.

Quite simply, Grow is a BASIC language program, currently available for Apple II, Apple II Plus and North Star, that allows you to write, in plain English and with only a few system commands, original, one-of-a-kind programs. These are contained in nodes, miniprograms themselves, linked together as needed to make up the entire program. In both Apple and North Star systems, the nodes are stored on disks as standard data files. The Grow program directs traffic between these files.

In operation it is similar to Pilot language, except this package is written in BASIC.

The Apple II version, written in Applesoft BASIC, requires 32K of RAM if BASIC is in ROM, 48K if BASIC runs out of RAM. The North Star version requires 48K RAM.

The number of commands you need to construct a lesson, network or game is tiny. In operation it is similar to Pilot language, except this package is written in BASIC.

Writing a Program

To write a Grow program, you load Grow and run it. The program will ask you to define a Default node, the node that the program automatically seeks whenever a user response is not contained in the current node.

For example, if the current node asks "Who discovered America?", that node would have been programmed in advance to accept Columbus, Ericson, Eskimos and perhaps others as correct answers. Should the student enter "The Beatles" or some other unpredictable response, the program will branch to the Default node. The Default node is coexistent with all nodes in active memory, and will send the student back to the original question or the answer, supply another question, or do whatever the program writer wants.

Similarly, the Default node is used in adventure games to respond with something like "YOU CAN'T GO THAT WAY FROM HERE" when a player is trying to go somewhere the current node doesn't like.

After completing the Default node, the Grow program then asks the program writer to complete the Initial node. When the particular program is run, it will automatically branch to the Initial node and begin. In an educational program, Initial might give a student the beginning instructions, or perhaps a directory of different exercises from which to select.

In an adventure game, INIT would define the first place a wanderer finds himself: YOU ARE IN THE MIDDLE OF A DESERT ISLAND. TO THE NORTH, THERE IS A PEACEFUL RIVER. TO THE EAST, THERE IS A MEADOW WITH A LARGE BEAST TEARING AT THE GROUND. TO THE SOUTH, THERE IS FORBIDDING MOUNTAINOUS COUNTRY. AND TO THE WEST, THERE IS DENSE JUNGLE, FROM WHICH CAN BE HEARD THE ROAR OF LIONS.

Using that adventure game Initial node as an example—it works exactly the same way for knowledge networks and computer-assisted instruction—the program writer then would use the program's EXTEND command. After typing in EXTEND, the program will ask for PATTERNS. The program writer then types in the responses that the user might be expected to make, and adds an action that the program should take.

In the example, he would enter NORTH, or N, as a pattern. The matching action would be G RIVER, which would then direct the program to the RIVER node. G is the program's shorthand for GOTO. EAST would call up G MEADOW, sending the user to the MEADOW node. NORTHWEST, or UP, presuming they were not patterns in the Initial node, would send the user to the Default node, which would tell the user YOU CAN'T GO THAT WAY FROM HERE, and return him to the current node, in this case the Initial node.

Thus, the command EXTEND allows the program writer to extend the program in any way, from any node, as he pleases.

The other major command is EDIT. When you type in EDIT, the program will display the entire current node, and let you rewrite, correct, add, delete or modify patterns and actions. This makes editing and debugging of the written program remarkably simple.

The command P, shorthand for PRINT,

Edgar F. Coudal heads an advertising and PR agency (627 S. Crescent Ave., Park Ridge, IL 60068).

is used in writing the nodes to tell the program what to display on the screen.

The Grow program also keeps score. By adding + and – numbers to pattern/action pairs, an internal score is maintained by the program. That score is displayed upon completion of the session with the Grow program, which is indicated by simply typing in QUIT. The obvious use of this in grading students is most valuable.

The final command is %, for random response. This is particularly useful in constructing adventure games, and can be used in CAI to vary the order of the way problems are presented. By simply prefixing a % sign and a number to a G command, the program is instructed to send the user that percent of the time to a particular node or to send him to some other node. For instance, the following pattern/action command pair

```
NORTH
—
%50 G RIVER
G OCEAN
```

would put the intrepid explorer in the node called RIVER 50 percent of the time the game is played and in the node OCEAN the rest of the time.

To sum up, following are all the commands needed to write your own knowledge networks, adventure games, or classroom instructions.

Grow is a remarkable program-writing package for the person who doesn't know anything about programming.

- DESCRIBE defines default, init, and new nodes.
- EXTEND adds pattern/action pairs to nodes.
- EDIT modifies and corrects nodes.
- PRINT tells the program what to display on the screen.
- G (GOTO) directs traffic between nodes.
- + and – keep a running score of the user's performance.
- % (RANDOMNESS) puts the unexpected in the program.
- QUIT ends the session, and presents the score.

In the EDIT mode, the following additional commands allow manipulation of existing nodes:

- LIST displays part or all of the current node.
- DEL deletes specified parts of a node.
- RENUM renumbers lines in a node to facilitate editing.
- DONE tells Grow you're through editing.

The factory system disk contains the Grow program and a separate Gardener program, which is similar to Grow's internal editor. The Gardener has additional capabilities to do heavy rewriting of existing nodes without actually running the program to get to a specific node, as you must do with the editor.

The factory diskette also contains extensive examples, including a CAI program (which instructs in computer use, of all things), a knowledge network and an adventure game. A little time spent poking around in those samples to see why the nodes do what they do is most instructive.

Conclusion

Summing up, Grow is a remarkable program-writing package for the person who doesn't know anything at all about programming, but who is willing to spend a couple of hours—at most—with the end result of developing unique and specific interactive programs.

It's available from Computer Systems Design Group, 3632 Governor Drive, San Diego, CA 92122, for $35, which covers the cost of the disk and tutorial and reference manuals. Manuals are available separately at $5 each. □

✓See List of Advertisers on page 242

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Visit our Computer Support Center for the Inland Empire's largest selection of ICs, books and computer accessories. Open daily. Check our prices and friendly service. **Inland Electro-Mart, 8624 California Ave., Riverside, CA 92504. 687-3776.**

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Computer hardware: North Star, Zenith, Atari, CBM/PET, Qume, Epson and others. Software: EduWare, Professional Software, Zenith, North Star, Programma, Personal Software and others. Factory trained service dept. Books, magazines, etc. Full product line on display. **Comtek Electronics, Inc., Rt. 46 West, Lodi, NJ. 472-2440.**

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Computer hardware: North Star, Zenith, Atari, CBM-PET, Qume, Epson and others, Software: EduWare, Professional Software, Zenith, North Star, Programma, Personal Software and others. Factory trained service department. Books, magazines, etc. Full product line on display. **Comtek Electronics Inc., Staten Island Mall, Staten Island, NY. 698-7050; Coney Island Ave. and Ave. X, Brooklyn, NY. 332-5933.**

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SS-50 Users: Expand present system to maximum or build from ground up. We provide PCBs for motherboards, interfaces, etc. Write for specs and information. **Quality Research Company, PO Box 7207, Spokane, WA 99207.**

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MICRO QUIZ

(from page 8)

Answer: 391

This program computes the largest factor of N. Since N = 5083 = 13*17*23, the largest factor is 17*23.

(from page 274)

baud rate. (Bits per second (bps), or baud, centers around 300 for most microcomputer applications. Rates up to 1200 are sometimes used, and Teletype operates at 110 bps.)

So you have a microcomputer with a serial port, and now you are looking at software to connect your station with a friend, your office, an information network like The Source, bulletin boards around the country, and soon, with your bank, cable television channels and mailing telegram services.

What to Look for

What should the software do? Here's a checklist of features:

- It should format displays to your screen. A display with words wrapped to the next line is informative, while a display of broken words without hyphens is unreadable.
- Terminal software should be able to copy the communication session into memory, warning you when memory is almost full and automatically turning off the copy action when the buffer is completely filled. You are paying good money for connect time. While connected, you want to scan the information rapidly, record the vital data, then review it later, off line, at your leisure.
- Software should allow you to send files as well as keyboard input. Suppose you want to place the same notice in several bulletin board systems. Why retype the notice slowly, with errors, each time? You should be able to put your message into a file before you call the bulletin boards, then transmit it to each of them by pressing a few command keys. Make sure you can format the file in the form that the receiver computer needs to get it, too.
- You should be able to switch rapidly and surely from command mode to actual communication. Inevitably, you will want to alter parameters during the transmission, even if only to turn the copy action on, off and on again. A good program allows you to make these changes with a minimum of keystrokes, and it keeps you informed of the status of the system. Poor software moves like molasses—or it leaves you wondering whether you are in copy mode or out of it.
- You should be able to play the role of host. When communicating with bulletin boards, large databases and other fancy computer systems, you will be in "originate mode." This means two things: 1) the host computer echoes your transmission back to you and 2) you occupy certain frequency levels for sending and receiving, while the host uses a complementary arrangement of frequencies for receiving and sending.

If you are going to communicate with

```
 1 ENTER CONVERSATION MODE
 2.TERMINAL/HOST/HALF DUPLEX (NOW 2.1)
 3 COPY BUFFER (NOW OFF)  2B00 2B00 9FFF
 4 CLEAR COPY BUFFER
 5.FILE  SAVE
 6.FILE  LOAD
 7 ADD LF TO SCREEN CR (NOW ON )
 8 SCREEN FORMATTING (NOW ON )
 9 SEND FILE              2B00 2B00 9FFF
10 EXIT MICRO LINK
11 MENU
12.CHANGE EXIT JUMP (NOW 04E7)
13 SEND CMD CHARACTER
14 COLD START
15.DD CHANGE LINE WIDTH
:
```

Sample 1. Principal command menu for Micro Link. Program has over 40 commands total.

BSTMS	Lifeboat Associates 1651 Third Ave. New York, NY 10028 212-860-0300	$200	CP/M systems
Smarterm	Computer Connection, Inc. 38437 Grand River Farmington Hills, MI 48108	$19.95 $23.95	OSI C2-4P MF, C4P MF systems OSI C2-8P DF, C8P DF, C4P DF systems
PET-TERM	Micro Computer Industries, Ltd. 1520 East Mulberry, Suite 110 Ft. Collins, CO 80524 303-221-1955	$39.95	PET with a 8010 or TNW modem
Micro Link	Wordcraft Microcomputer Software Assoc. 1122 B St. Hayward, CA 94541 415-534-2212	$89	8080 or Z-80 MDOS or CP/M
ASCII Express II	Southwestern Data Systems PO Box 582-AS Santee, CA 92071 714-562-3670	$64.95	48K Apple
Z-TERM	Southwestern Data Systems PO Box 582-AS Santee, CA 92071 714-562-3670	$99.95	Apple with Softcard
Micro-Courier	Microcom, Inc. 6 Faneuil Hall Marketplace Boston, MA 02109 617-367-6362	$250	Apple II
Micro-Telegram	Microcom, Inc. 6 Faneuil Hall Marketplace Boston, MA 02109 617-367-6362	$250	Apple II
Videotex	Radio Shack 700 One Tandy Center Fort Worth, TX 76102	$29.95 $29.95 $29.95 $29.95 $19.95	TRS-80 Color Computer TRS-80 Model I/III TRS-80 Model II Apple II package Dumb terminal
Omniterm	Lindbergh Systems 49 Beechmont St. Worcester, MA 01609	$99 $99	TRS-80 Model I TRS-80 Model III
CCI—Telnet, Version 5	The CPU Shop 5 Dexter Row Dept. IA08M Charlestown, MA 02129 800-343-6522	$149	CP/M compatible computers
Intelligent Terminal System ST-80111	The CPU Shop 5 Dexter Row Dept. IA08M Charlestown, MA 02129 800-343-6522	$139	TRS-80

another microcomputer user, one of you must play host. This requires extra duties managing the conversation as well as a reversal in frequency assignments. Your modem handles the frequency changes, but your software must take care of the housekeeping.

- The software must fit into your whole system. More than most programs, terminal software proves its usefulness if it can shift back to the operating system and be reentered easily and quickly. Can the terminal program be called from your operating system, from assembly-language programs and from BASIC?
- Comprehensive and understandable documentation, another nice feature with any program, is especially important for terminal programs. The program must interface with the specific input-output environment of your machine. The documentation is the key to easy installation. However, more is not necessarily better. You don't need a fat technical study; the essentials are all that you want to get started. Unlike other programs, terminal software is not a very interesting or useful item for detailed exploration. Once it is working, it works, and you won't be exploring the power of arrays, string processing and other goodies found in a language or database management system, for example.
- Good terminal software is flexible. The list above presents a wide range of requirements. Ideally, you can set a number of software switches independently in the terminal program to configure it for the application you have in mind. At the same time, you do not want to spend half an hour setting up the program for each use; here, well-chosen default settings make a powerful program easy to use, too.

There are also features of software that you probably do not need. Unless you make a living programming, you do not need sophisticated procedures for sending binary files in raw form with checksums and automatic retries.

Make sure, too, that you do not need to purchase the program in pairs. You should be able to communicate with the other end—be it microcomputer, dumb terminal or mainframe—regardless of the software it uses.

Some fine programs that meet these requirements are on the market, and more are sure to appear. A microcomputer with intelligent terminal capabilities allows you to work in your home, office or shop, up to the limit of your resources; then you draw on the power of shared information and processing, thus maximizing all the advantages.□

SMART	MicroPeripheral Corp. 2643 151st Place, N.E. Redmond, WA 98052 206-881-7544	$79.95	TRS-80 Model I with Radio Shack Modem I (Also available for TRS-80 Model III for $99.50.)
TSMART	MicroPeripheral Corp. 2643 151st Place, N.E. Redmond, WA 98052 206-881-7544	$79.95	Atari 800
Terminal Emulator I	Texas Instruments PO Box 53 Lubbock, TX 79408	$44.95	TI 99/4
Terminal Emulator II (Similar to TMI but with additional features such as speech and color.)	Texas Instruments PO Box 53 Lubbock, TX 79408	$49.95	TI 99/4
TERM	SuperSoft Associates PO Box 1628 Champaign, IL 61820 217-359-2112	$150	32K CP/M
ITERM	Infosoft Systems Inc. 25 Sylvan Rd. South Westport, CT 06880 203-226-8937	$100	48K CP/M

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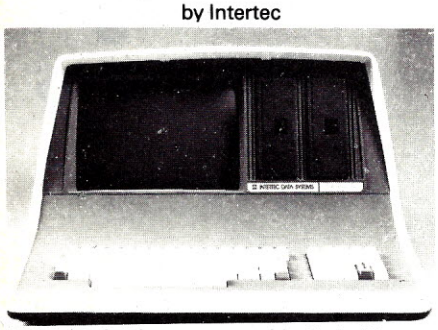

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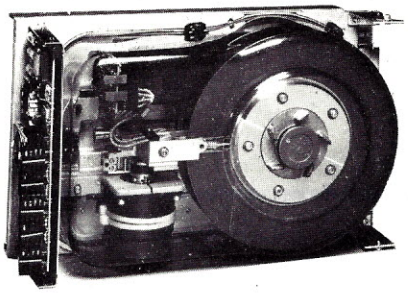

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By Geoffrey Sinclair

Terminal Software

Selecting The Right Programs

A sampling of terminal software for selected systems (not a comprehensive list of all available programs).

Name	Available From	Price	System
ASCOM	Westico 25 Van Zant St. Norwalk, CT 06855 203-853-6880	$175	CP/M 1.4 or higher
The Communicator	DYNACOMP, Inc. 1427 Monroe Ave. Rochester, NY 14618 716-586-7579	$49.95	Atari
Telelink	Computer Mail Order 501 E. Third St. Williamsport, PA 17701 800-233-8950	$20	Atari
Crosstalk	Microstuf, Inc. Box 33337 Decatur, GA 30033	$75	CP/M systems
Terminal-80	Instant Software Order Dept. Peterborough, NH 03458 800-258-5473	$24.95	TRS-80 Level II
The Communicator	Instant Software Order Dept. Peterborough, NH 03458 800-258-5473	$9.95	TRS-80 Level II
Telcom	Mumford Micro Systems Box 435-C Summerland, CA 93067 805-969-4557	$29.95	TRS-80
Telink	Softstuff Heath Co. Dept. 351-708 Benton Harbor, MI 49022 800-253-0570	$39.95	Heath H89 and H8/H19/H17
QS Smart Terminal	Quality Software 6660 Reseda Blvd. Suite 105 Reseda, CA 91335 213-344-6599	$49.95	Sorcerer

More →

Information communicated over telephone lines is the wave of the future—the very near future—and as an owner of a microcomputer you have significant advantages. But your end of the growing volume of bits pulsing over the lines won't stand out from others unless you have good software.

Programs enabling the microcomputer to function as an intelligent terminal will become as common as word processing programs are today. Inevitably, some products will be easy to use and a real enhancement to your system, while others will amount to a user-financed lesson in the potential difficulties of this application.

Below is a checklist of features for a good terminal program. But first, a little explanation of the basic function is needed.

Microcomputers use telephone lines to communicate with each other and with larger host computers through asynchronous serial transmission and reception. Asynchronous essentially means that one character is transmitted at a time in a burst of eight bits, plus several bits around it for signalling purposes. Banks, airlines and other corporations with large computer networks send extensive blocks of data at one shot in synchronous mode. It pays when the volume of data is large, but a heavy overhead of communications protocols must be attended to by programmers.

Serial transmission breaks the byte into its eight component on-off bits, each being sent and received one after the other. A serial port on your computer is essential, and it should have a selectable

(continued on page 269)

Geoffrey Sinclair writes terminal software for Wordcraft in Hayward, CA.

If you can beat these prices, you must have a brother-in-law in the business.

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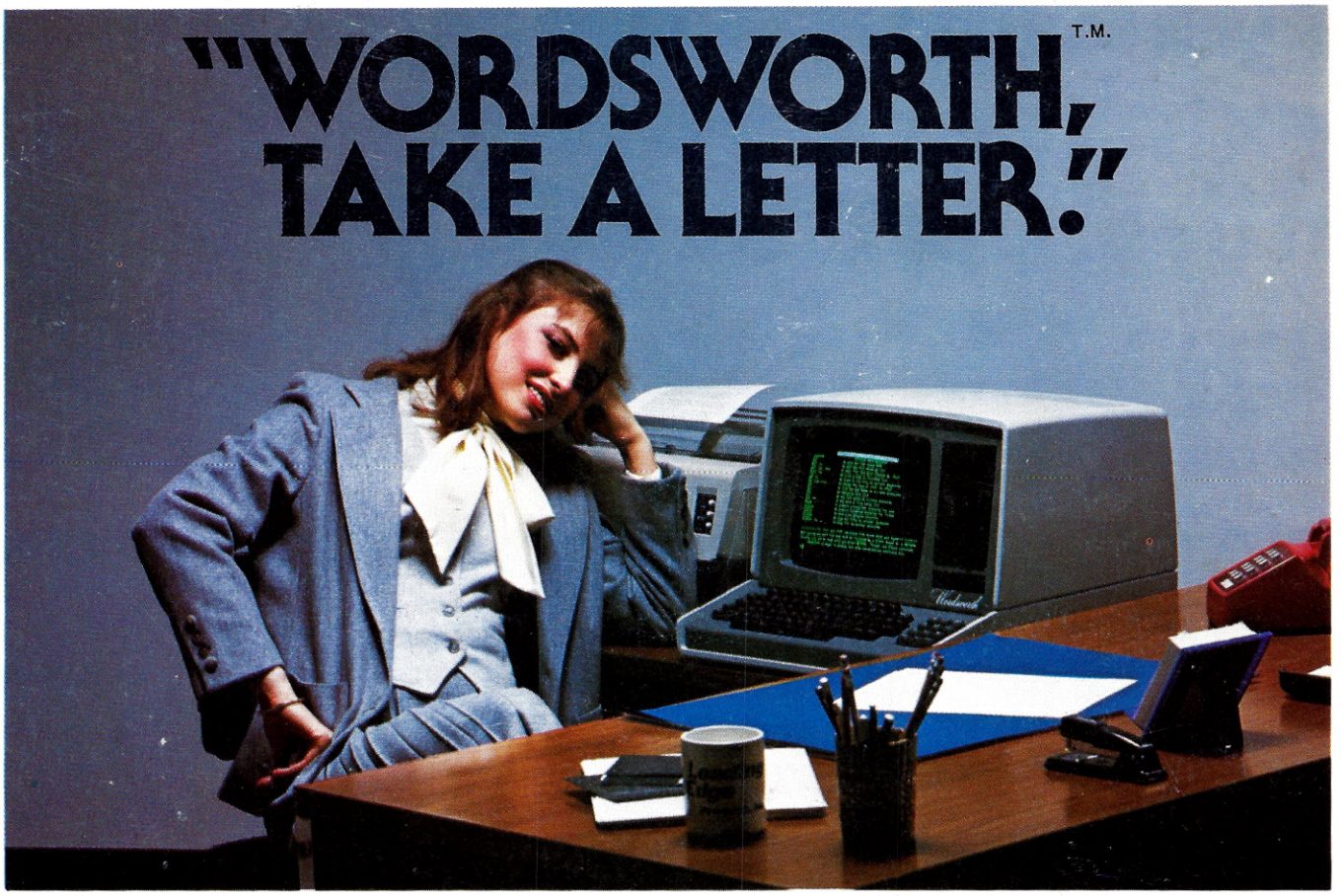

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